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BULLETIN No. 82.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
A. C. TRUE, Director.

REPORT

ON

AGRICULTURAL INVESTIGATIONS IN ALASKA

IN

1899.

BY

C. C. GEORGESON, M. S.,
SPECIAL AGENT IN CHARGE OF ALASKA INVESTIGATIONS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Office of Experiment Stations,
Washington, D. C., February 21, 1900.

Sir: I have the honor to transmit herewith a copy of the third report on the agricultural investigations in Alaska, prepared under your instructions in compliance with the provisions of the acts of Congress making appropriations for this Department for the fiscal years ending June 30, 1899, and June 30, 1900. By these acts the Secretary of Agriculture was authorized to investigate and report to Congress upon the agricultural resources and capabilities of Alaska and to undertake the establishment and maintenance of agricultural experiment stations in said Territory. The work in Alaska during the past year has therefore differed from that of former years in that the beginnings have been made of the establishment of permanent experiment stations and the organization of a regular force to carry on their operations. Prof. C. C. Georgeson has continued to be the special agent in charge of the Alaska investigations and has prepared this report, which gives an account of the work done under his supervision during the calendar year 1899.

This report has been transmitted to Congress and printed as a document of the House of Representatives. Congress having further ordered the printing of a special edition for the use of this Department, I respectfully suggest that these copies be utilized as Bulletin No. 82 of this Office.

Respectfully,

A. C. True,
Director.

Hon. James Wilson,
Secretary of Agriculture.

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FIG. 2.—NEW CHURCH AT SITKA.

56TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 314.

THIRD REPORT

ON THE

INVESTIGATIONS

OF THE

AGRICULTURAL CAPABILITIES OF ALASKA.

1899.

JANUARY 16, 1900.—Referred to the Committee on Agriculture and ordered to be printed.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

THIRD REPORT

ON THE

INVESTIGATIONS OF THE AGRICULTURAL CAPABILITIES OF ALASKA.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 13, 1900.

SIR: I have the honor to transmit herewith a third report on the investigation of the agricultural capabilities of Alaska, made in compliance with the acts of Congress making appropriations for this Department for the fiscal years ending June 30, 1899, and June 30, 1900. The investigations have, in my judgment, confirmed the desirability and feasibility of maintaining agricultural experiment stations in Alaska, and I earnestly recommend that sufficient provision be made by Congress to establish such stations in the Territory on a permanent and efficient basis, as is done elsewhere in the United States.

I have the honor to be, sir, your obedient servant,

JAMES WILSON, *Secretary.*

The PRESIDENT.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., January 12, 1900.

SIR: I have the honor to transmit herewith a report on the agricultural investigations in Alaska conducted under my direction during the past year. This report is in continuation of that transmitted to Congress January 19, 1899, which was published as House of Representatives Document No. 169 (Fifty-fifth Congress, third session), and afterwards as Bulletin No. 62 of this office, and covers the work performed during the calendar year 1899. As the result of the reports of these investigations previously made Congress made a third appropriation for this work for the current fiscal year, increasing the amount from $10,000 to $12,000, of which sum $7,000 was made immediately available. The terms of the appropriation were changed and the Secretary of Agriculture was authorized to expend this fund "to investigate and report to Congress upon the agricultural resources and capabilities of Alaska and to establish and maintain agricultural experiment stations in said Territory, including the erection of buildings and all other expenses essential to the maintenance of such stations." As the terms of this appropriation indicated that experiment stations were to be regularly maintained in Alaska as in other parts of the United States, plans were at once made for putting our work in that Territory

on a permanent basis. As it was decided that on the whole Sitka, the capital of Alaska, would be the most convenient place in which to establish an office and laboratory and from which to supervise investigations along the coast, as well as in the interior, and to disseminate information regarding these investigations in different parts of the Territory, it was deemed essential that a building should be erected at that place, which might serve as headquarters for these investigations. Plans were therefore drawn for a simple, but substantial, wooden building containing ten rooms, which might be used as offices, laboratories, and quarters for the special agent in charge. Castle Hill, a lot in Sitka which a number of years ago was set aside as a site for Government buildings which were afterwards located elsewhere, was selected as the site for the experiment-station headquarters, having been reserved for this purpose by an order of the President. The construction of the station building on this site was begun as soon as a contract could be made. The building has been inclosed and the lower story has been finished, but the amount of available funds did not warrant its completion.

Prof. C. C. Georgeson was continued as special agent in charge of the investigations, and the regular force was increased by the appointment of two assistants and one laborer. Provision was also made for engaging the services of other temporary assistants and laborers as occasion might demand. A considerable number of farm implements and four work oxen were purchased.

The clearing of land for experimental purposes was undertaken at Sitka and at Kenai, in Cook Inlet, on the reservations made for that purpose the previous summer. Much difficulty was experienced in obtaining suitable laborers to assist in the work at Sitka, and the task of clearing and draining the land proved more formidable than was expected. Some six acres of new ground have, however, been cleared and partially drained. A road has also been built along one side of the farm and another up to the station building on Castle Hill. At Kenai about three acres of land have been cleared and a combined log barn and implement shed erected. A log silo has also been constructed there and filled with native grasses.

The experimental work was similar to that of the previous year, and consisted largely in growing different varieties of cereals, forage plants, flax, and vegetables at Sitka, Kenai, and Kadiak. Experiments were also made in making and storing silage and in making hay from native grasses. The correction of the acidity of new land with lime was successfully tried. Further information regarding agricultural conditions in different parts of Alaska was obtained through circulars of inquiry. Seeds were also distributed in a number of different regions. The results of the work this year have confirmed those previously obtained in these investigations. Sufficient evidence has been obtained to show definitely that a considerable variety of vegetables can be successfully grown in different parts of Alaska. It has also been shown that in southeastern Alaska and in Cook Inlet oats, barley, buckwheat, and spring wheat will mature with careful culture. It has been shown that the failure of many attempts to grow crops in Alaska has been due to the natural acidity of the soil and the lack of drainage. When these difficulties are removed by proper treatment the land is fertile and productive.

During the present year the work in the coast region will be continued in the same lines as heretofore, special attention being given to studies of the soil and the methods of treatment necessary to fit it for

agricultural uses. Something will also be done in determining how native grasses can be best utilized for the maintenance of live stock. Besides this, it is proposed to extend our work into the interior, by sending Professor Georgeson and one assistant there to determine by personal observations the agricultural capabilities of various regions, and to select a few places where definite experiments in agriculture may be undertaken. It is hoped that a beginning of experiments in at least one place in the interior may be made the coming season.

Necessarily a relatively large amount of time was given last year to the erection of buildings and the clearing of land. This work should be continued this year so far as to complete the headquarters building at Sitka, construct the small buildings needed on the reservations at Sitka and Kenai and make some additions to cleared land for experimental purposes. The completion of the headquarters building at Sitka is especially important. Until that is done it is impracticable to undertake the laboratory operations, collection of samples of soils and native and cultivated plants, and the making and recording of observations of various kinds which are essential to the systematic prosecution of experimental inquiries in agriculture. It is earnestly hoped that this fact will be taken into account in considering the appropriation necessary for the continuance of these investigations. It is estimated that $3,000 will be required for the completion of the headquarters building, and we should have an additional sum of $1,000 for furniture, office fixtures, and laboratory equipment.

The remoteness of the region, the inadequate and expensive means for transportation, and an insufficient and high-priced supply of labor materially increase the cost of agricultural investigations in Alaska. The work in Alaska, moreover, does not receive any financial aid such as is directly or indirectly given to the stations in other parts of the country, either by the State governments or by the colleges with which the stations are connected. In view of these facts and the need of additional funds for the completion and equipment of the station headquarters, it is hoped that the appropriation for the Alaska stations will be increased this year to at least the same amount as is given to each of the stations in the States and Territories ($15,000). As hitherto, a portion of this appropriation should be made immediately available in order that active operations during the spring of 1900 may be prosecuted without financial hindrance, and it is therefore recommended that half of the appropriation be provided for immediate use.

Very respectfully,

A. C. TRUE, *Director.*

Hon. JAMES WILSON,
Secretary of Agriculture.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., January 4, 1900.

SIR: I have the honor to submit herewith my report on the Alaska Agricultural Experiment Stations for the season of 1899.

The work has been largely of a pioneer nature. Land has been cleared and prepared for cultivation on the reservations at Sitka and Kenai. A two-story headquarters building has been partly completed at Sitka and a log barn and silo have been built at Kenai.

Further experiments in the growing of cereals and vegetables at Sitka, Kenai, and Kadiak were carried out on the lines followed last year with the most gratifying results, especially at Sitka and Kenai, where spring wheat, barley, oats, flax, and buckwheat all matured and all the common vegetables were likewise grown successfully.

Very respectfully,

C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

Dr. A. C. TRUE,
Director Office of Experiment Stations.

REPORT

ON THE

AGRICULTURAL INVESTIGATIONS IN ALASKA FOR 1899.

By C. C. GEORGESON, M. S.,

Special agent in charge of Alaska Investigations.

INTRODUCTION.

Inasmuch as the present year's work in the investigation of the agricultural possibilities of Alaska is but an elaboration of the plans which were formulated and partly inaugurated last year, a brief summary of last year's work and its results would, perhaps, aid in giving a more comprehensive view of the whole subject and serve as a suitable introduction to the present report.

Last year's work may be classed under three subheads: First, the examination of various portions of the coast region with a view to finding suitable locations for experimental work; secondly, the surveying of tracts of land which were to be reserved for permanent experiment stations, and thirdly, growing vegetables and cereals in order to test the adaptability of the climate to the requirements of farm crops.

The examination of the coast region was, perforce, limited to the places touched by coasting steamers, because these were the only means of transportation. Between Sitka and Unalaska, with a coast line of 3,000 miles or more, these steamers touch only about a dozen settlements. There are, therefore, long stretches of country, concerning which comparatively little is known beyond a general knowledge of the leading physical features which can be seen from the steamer's deck. The coast is, for the most part, broken by numerous bays and inlets and many of these are skirted by more or less extended tracts of level land susceptible of cultivation. Many natural meadows may be seen which produce a dense growth of grass that would afford excellent food for live stock could it be utilized. Such places would be ideal in which to start farms; but the location of an experiment station in Alaska must be governed as much by the means of reaching it as by the nature of the site. Transportation facilities are as yet so inadequate that most of the desirable places can not be reached by following the usual coastwise traffic, and many otherwise suitable localities could not therefore be considered.

The commission which visited Alaska in 1897 recommended Sitka and Kadiak as, on the whole, the best points on the coast for experimental work, and it was accordingly decided to locate stations at these places.

After an examination of that portion of the Kenai Peninsula which borders on Cook Inlet, the writer recommended that a station should also be located at the village of Kenai, at the mouth of the Kenai River, which appeared to be a particularly suitable location. There are large areas of land on the Kenai peninsula which, from the standpoint of both soil and climate, appear to be well adapted to agriculture. The land is level or gently rolling and, while timber is not wanting, there are also large tracts of natural meadow which can readily be subdued. These conditions will favor early settlement, and a station will be of much service in that region.

The next step consisted in surveying the tracts which had been selected at the three places named. At Sitka most of the available agricultural land had already been claimed by settlers and an established institution (the Presbyterian Mission). However, a tract of 110 acres of rolling land, located in the valley back of the town, was still unclaimed by anybody. It was therefore appropriated and surveyed, and a beginning made in clearing it.

At Kadiak a tract of 166 acres adjoining the town and at Kenai 320 acres were surveyed. I submitted charts and field notes of these tracts along with my report. These sites were subsequently reserved for the establishment of permanent experiment stations by order of the President of the United States.

The purely experimental phase of the investigations, that of growing crops, was undertaken on a small scale at Sitka and Skagway. In both places this work was confined to small garden patches. At Sitka gardens which had been under cultivation for several years were obtained; but at Skagway only new land could be had, the town being only a year old. Briefly stated, these experiments were decidedly successful, contrary to the predictions of many who had lived in Alaska for years; barley, oats, and flax not only matured perfectly, but yielded grain of superior quality and weight. Clover and grasses also made large growth, and all the hardy vegetables grew with great vigor and yielded products of high quality. All of this is detailed at length in the report I had the honor to submit last year.

THE PRESENT SEASON'S WORK.

The plans for the prosecution of the work during the season just closed contemplated the continuation of the cultural experiments; the opening up of the stations at Sitka, Kadiak, and Kenai; the erection of a headquarters building at Sitka, and the construction of such farm buildings as were needed for the shelter of work animals and implements; all of which has been accomplished to the extent the appropriation would permit.

THE EXPERIENCE OF LAST YEAR CONFIRMED.

The experiments with small grain were undertaken on a somewhat larger scale than last year, owing to the fact that I secured the use of more garden patches. Hon. John G. Brady, governor of Alaska, contributed not a little to the success of the work by again placing a portion of his garden at my disposal. (See Pl. V, fig. 1.) Father Anthony, chief priest of the Russian church, likewise kindly permitted me to use three of the lots belonging to the church, and for the coming year has promised me the use of still another. Several other residents of Sitka also allowed portions of their gardens to be used for this purpose.

All of these patches, with the patch on Japonski Island, placed at the disposal of the Secretary of Agriculture by the Navy Department, and a rented lot of about three-fourths of an acre, aggregate, perhaps, 3 acres. These patches were scattered all over town, which fact, together with the further facts that the fences around most of them were insecure, the town cows and pigs, which run at large, very unruly, and the chickens and tame rabbits an insupportable nuisance, required the expenditure of an undue amount of time, labor, and vigilance for the areas involved. And in spite of all precautions, these various destructive agencies succeeded in doing considerable damage in the course of the summer. It is, to say the least, farming under exasperating difficulties, but it is the best that can be done until a portion of the station land is put in shape for cultivation.

Special emphasis was placed on the testing of grain crops, although the hardy vegetables were also grown, but only in small quantity. Vegetable growing in Alaska is no longer a matter of experiment. It has been abundantly proved that all the common, hardy vegetables which are grown in the gardens of the States, such as potatoes, cabbage, cauliflower, kale, peas, onions, carrots, parsnips, parsley, lettuce, celery, radishes, turnips, beets, and the like, in their numerous varieties, can be grown in Alaska to a high degree of perfection and attain a crispness and delicacy of flavor which is rarely equaled in the best farming regions of the States, because they are there very frequently dwarfed and toughened by drought and heat. Those of the common vegetables which can not be grown well in Alaska are tomatoes, beans, cucumbers, melons, and sweet corn; and of these, beans and cucumbers may be grown with moderate success. Both last year and this the writer raised wax beans quite large enough for use, and he saw last year in a garden at Skagway and this year on Mr. Baker's farm, near Killisnoo, cucumbers some 5 or 6 inches long, grown in the open. Vegetable gardens can be made not only successful but remunerative anywhere along the coast where a local market is afforded. Mr. Thomas Baker, of Hootz Bay, near Killisnoo, who owns the farm above referred to; Mr. Reinhart, of Juneau, and Mr. Wadelich, who lives some 14 miles north of Juneau, are demonstrating this by their successful market gardens. The experiments in vegetable growing at the station should, therefore, aim at improvements in methods of culture, combating destructive insects, the selection and growing of seed, etc., rather than a mere test of varieties. That they will grow there does not need further proof.

It is otherwise with the grains. So far as the writer has learned, they have never been tried there, chiefly because of a rooted conviction that they could not be grown in Alaska. Some residents have freely expressed the opinion that attempts to grow grain must necessarily result in failure. Nevertheless, a few varieties of barley and oats ripened perfectly last year, and this year not only barley and oats ripened, but also several varieties of spring wheat and both fall and spring rye at Sitka and Kenai.

Of forage plants, red, mammoth, alsike, and white clovers, which were seeded and grew luxuriantly last year, lived through the winter, and this year presented as fine a growth as it has been the writer's privilege to see anywhere. They all bloomed profusely, and the earlier heads developed seed which was ripe enough to grow before frost came. (See Pl. V, fig. 2.) Vetches, lupines, rape, field peas, and timothy likewise grew vigorously and yielded a large amount of forage. A mixture of oats and peas, which were seeded thickly about the middle of June for feed, covered the ground with a dense growth, more than 2 feet deep, by

August 23, when the crop was put in the silo, the peas showing bloom and the oats beginning to head.

Whatever the future may prove in regard to the adaptability of the climate for grain growing, it is certain that it is safe to depend on growing an abundance of feed for live stock every year. Dairying, beef, mutton, and wool production are therefore assured of success. Wild grasses are abundant in many places in southeastern Alaska, chiefly on tide flats, from which they have not yet been driven by the ever aggressive, omnipresent spruce; but these patches are in most cases small and too far apart to make it practicable to utilize many of them. In the region about Cook Inlet the forest growth is light and the areas of natural meadow are in some places very large, while at Kadiak and westward grass takes the place of the forest.

SERIOUS DRAWBACKS TO GRAIN GROWING.

The fact that grain will mature does not solve the whole problem of successful grain growing in Alaska. Speaking now for southeastern Alaska alone, to which our experience has so far been confined, it is evident that there are serious drawbacks to overcome before grain growing can be pronounced an unqualified success. One of these is the heavy growth of straw induced by the moist climate and rich soil. This not only retards the ripening of the grain, but reduces its chances to stand up against the windstorms which visit the coast with considerable regularity in the fall of the year. These storms beat down the already top-heavy straw, and if this happens before the grain is fully developed, the chances are that if it develops at all it will ripen unevenly and at best be of poor quality. How far it may be possible to remedy this by improving the soil and by the selection and breeding of varieties with short and stiff straw remains to be proven. Our experiments will be directed to this end.

Another condition which promises to be a serious drawback to the saving of small grain is to be found in the copious autumn rains which seldom fail to set in on the coast in early September or sometimes even in August before the grain is ripe enough to harvest. It is true the Alaskan coast is not the only place where rainy weather prevails in the fall. Western Scotland and all the countries around the Baltic Sea not infrequently suffer from the same cause, and the farmers there, by care and vigilance, usually save their crops. The same care should also save them in Alaska. Judicious use of storm covers for the shocks and perhaps also large open sheds in which to complete the drying, when necessary, would help to overcome this difficulty. Early maturing varieties with short, stiff straw would be an advantage in this case also.

On the other hand, Alaska will in some respects have the advantage over warmer regions. It does not seem probable, for instance, that rust and other fungous diseases difficult to control will attack small grain in Alaska with the destructive virulence with which they usually attack grain fields in warmer regions. In some parts of the grain-growing West common wheat rust will often blast the promise of an abundant yield in three or four days. Of course two seasons' experience in grain growing on a very small scale can not be set up as a criterion on which to base conclusions; but the almost total absence of diseases of this nature is at least negative evidence, which is strengthened by the fact that the cool summer weather is against their rapid propagation.

CLIMATE ADAPTED TO FLAX GROWING.

Our two seasons' experiments with flax growing on a small scale have been very successful. Last year Riga flax grown on rich ground produced a rather coarse straw over 3 feet tall, but with a good fiber. On sod ground which did not admit of the best preparation it grew 2½ feet tall, with a good quality of fiber; while on new ground poorly drained it was a failure as a fiber crop, attaining a height of only 6 inches; but it matured seed in all three places.

This year we have the same results. In an old garden patch with rich soil it was a yard tall, with a tough fiber, but coarse straw, while at the Kenai station, on a sandy loam, well drained, though new ground, it averaged about 2½ feet tall and produced a very even quality of straw, with fine and strong fiber. In every instance the seed matured. The climate is evidently propitious for flax growing, and this being the case there appears to be no reason why the linen industry could not some day be made to flourish in Alaska.

EQUIPMENT.

The stations at Sitka and Kenai have each been equipped with 1 yoke of oxen, an ox cart, 2 plows, a harrow, a scraper, a stump puller, 4 cold-frame sashes, and necessary hand tools, including wheelbarrows, spades, shovels, rakes, hoes, axes, mattocks, scythes, etc. The Sitka station was also supplied with an ox wagon, a seeder, and a cultivator. At Kadiak only hand tools were furnished, as it was not intended to undertake more than a trial of cereals and vegetables at that point, because the appropriation did not permit more extensive work. Some doors and windows were also bought to put into cottages it was contemplated to erect, but for want of funds no farm buildings were built at Sitka and only a log barn and silo at Kenai. This equipment must be somewhat augmented next year.

ASSISTANTS AND LABORERS.

Two assistants were assigned to duty with me, Mr. C. H. Robison, of Michigan, and Mr. H. P. Nielsen, of Kansas. Mr. Robison remained at Sitka during the season, and Mr. Nielsen was put in charge of the work at Kenai.

In addition three laborers were hired to go with this expedition to Alaska, two from Minnesota and one from Kansas, but at the last moment the Minnesota men changed their minds and refused to go; consequently only one monthly hand went, and he was sent with Mr. Nielsen to Kenai, where both did excellent work.

At Sitka we had to depend on such help as could be hired by the day from among prospectors and others who were temporarily stranded there. This labor cost from $2 to $2.50 per day, and of course but few of the men could be depended upon for steady work. It is highly desirable that a few good men should be hired for the summer, and one or two by the year, in order to be able to count on some help at all times.

At Kadiak only one man, Mr. George A. Hill, who was a resident of the place, was hired for the summer. His services terminated October 31.

WORK AT SITKA.

I arrived at Sitka April 6 with two assistants, C. H. Robison and H. P. Nielsen, and one laborer, J. Anderson. At that date there was still considerable snow in places protected from the sun, and the ground was too wet to work, but not frozen. It continued cold and stormy, with much rain and frequent flurries of snow, all through April and well into May. We constructed and seeded cold frames soon after arrival, and began the preparation of the most favorably situated garden patches. These patches had to be dug and prepared by hand labor, as they were generally too small to use the oxen to advantage. The first seeding was made April 21, and was continued as the weather permitted and the ground was ready until May 18, when the spring seeding was finished. This happened to be the date on which the first seeding was made the year before. On Sunday, April 16, the little steamer *Dora* called at Sitka on her westward trip, and Mr. H. P. Nielsen, with his helper, Mr. Anderson, took passage on her for Kenai. They took with them a yoke of oxen with their forage, the seed they would require, a portion of which was for distribution among the natives, some lumber, and implements. Most of the equipment for this station I shipped direct from Seattle by steamer *Excelsior*.

SMALL GRAIN AT SITKA.

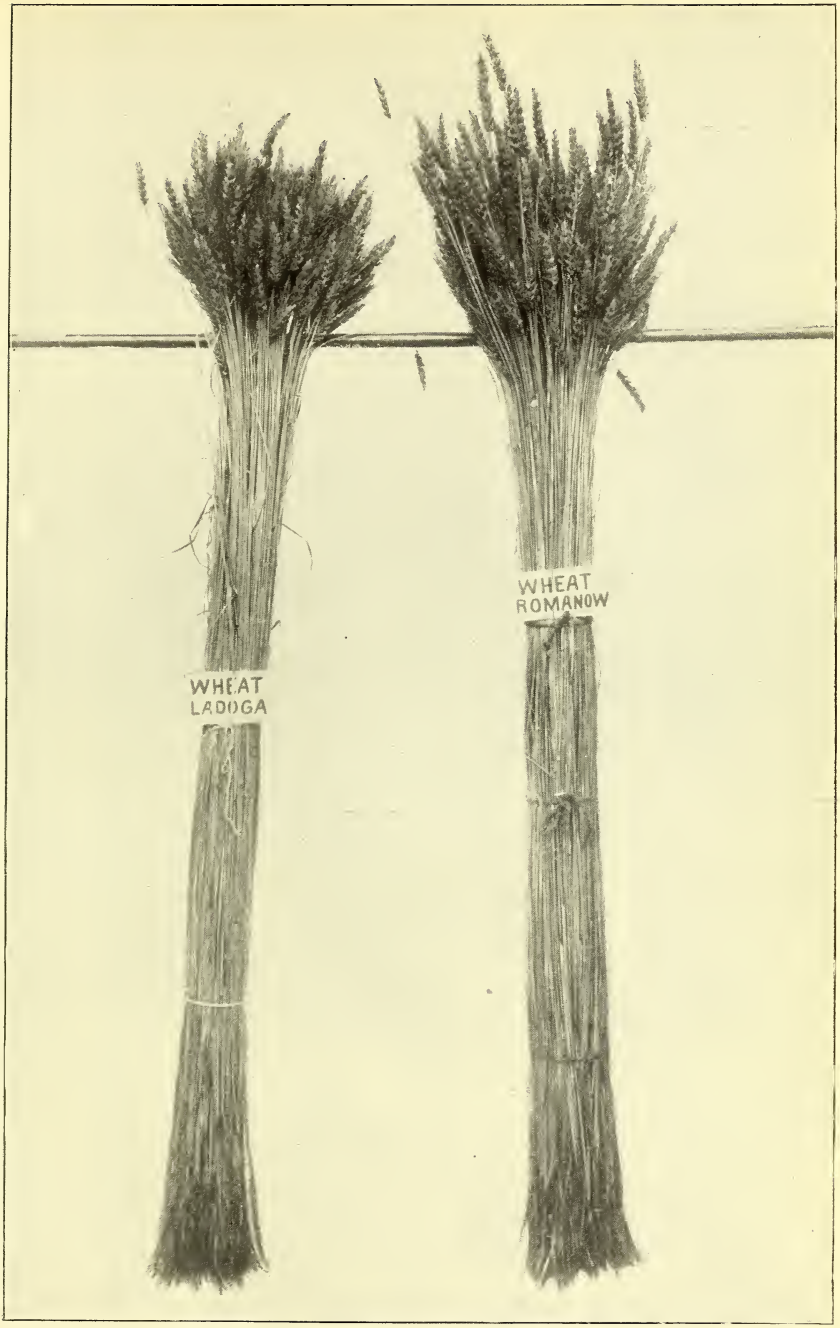
The following varieties of small grain were grown at Sitka the past season. They were grown both in rows and broadcasted. The rows, it should be stated, occupied favorable situations on a gentle incline toward the south. The broadcasted grains were seeded in various patches about Sitka, and, on the whole, were not so well situated as the samples grown in rows. Nevertheless, there was but little difference in the length of the season of growth from seeding to maturity, and without exception the broadcasted plats matured as well as the rows seeded on corresponding dates.

WHEATS.

Romanow.—Seeded April 21 and grown from seed imported from Russia by the United States Department of Agriculture. Under date of July 7 it is noted that the patch looked healthy but was not extra vigorous, the best being only 30 inches high. On July 22 this variety proved to be the most advanced of the lot. It was of good color and had a strong stalk. It was at that date nearly all headed, and measured from 3 to 3½ feet in height. August 1 it was in full bloom; August 22 it had begun to turn yellow, and the berry was hardening; it had large, well-filled heads; September 5 it was fully ripe and harvested. On September 14 it was dry and brought under shelter. (Pl. II.)

This variety is not only the earliest but in other respects the most promising of any of the spring wheats grown.

Ladoga.—Grown from seed imported from Russia by the United States Department of Agriculture; seeded April 21. On July 7 it is noted that it was not quite as vigorous as the preceding variety, Romanow. The plants were 2 feet high with upright leaves. July 22 it was noted that it had a somewhat more slender straw than the Romanow, and had not tillered so well; but it had a good color and appeared healthy. It was a little uneven in height, varying from 2 to 3½ feet, and it had nearly all headed out at that date. On August 1 it was in full bloom; August 26 it had begun to turn yellow; the heads



SPRING WHEAT GROWN AT SITKA, 1899.

were well filled and the berry hardening. On September 5 it was fully ripe and harvested. September 14 it was dry and brought under shelter. (Pl. II.)

Like the preceding, this variety appears also to be valuable for a northern climate, in that it matures early and seems to be adapted to the cool, moist weather of the coast region of Alaska.

The following varieties were all later than the two preceding, but, nevertheless, matured sufficiently before a killing frost occurred to insure the germination of the seed:

Preston.—Seeded May 2. July 7 the best measured 2 feet and gave promise of a fair crop. July 22 it was nearly all headed out and measured 3½ feet in height. It had a fairly good color, but was slightly affected by rust. August 1 it was all headed and beginning to bloom, the best being 4½ feet tall. August 26 some heads were well filled with large kernels in the milk, while others were still in bloom. September 25 it was in the dough, but still green, and it was noted that the tillers had produced many young heads which had just passed out of bloom. October 10 it was cut and ripe enough to grow.

Wellman Fife.—Seeded May 2. July 7 it had a promising appearance, being of a healthy color and 2 feet tall. July 22 it was nearly all headed out and measured 3½ feet high. The straw was coarse and strong. August 5 it was in full bloom. August 26 it was still green, without any signs of turning, and the berry was in the milk. October 10, when the first frost occurred, it was cut, being ripe enough to grow.

Glyndon.—Seeded April 21. July 7 it had made a fair growth, but measured only 22 inches. July 22 it was noted that it appeared less vigorous than adjoining varieties; was of a dark-green color; was about half headed out, and measured from 2 to 3 feet in height. August 5 it was in full bloom, 4½ feet high. August 22 the heads were well filled and the berry in the milk. September 25 it was in the dough, but could scarcely be said to have begun to ripen. October 10 it was ripe enough to grow and was then cut.

Bolton Blue Stem.—Seeded April 21. July 7 it measured 1½ feet and was not very promising. July 22 it had begun to head out; was of a good color, but short, being only 2 feet high. August 1 it was fully headed and began to bloom, the best measuring then 4½ feet. On September 25 it was in the dough, but had not made much progress toward maturing. October 10 it was ripe enough to grow and was cut.

Wild Goose.—Seeded April 21. July 7 it was not promising, being slightly affected with rust and only 18 inches high. July 22 it was noted that it had decidedly improved during the preceding two weeks. It was then heading out and measured 2½ to 3 feet. August 1 it was beginning to bloom. On August 26 some late heads were still blooming and the straw appeared weak. September 25 the earliest heads were in the dough state and beginning to turn. October 10 it was ripe enough to grow.

Black Sea.—Seeded April 21. July 7 the plants appeared slender or even spindling, the best measuring 2 feet. July 22 it appeared backward, the average height being only 2 feet, and was just beginning to head. August 5 it was fully headed and beginning to bloom. August 26 some heads were still in bloom; in others the berry was in the milk. September 25 it was in the soft dough, but still green. October 10 it was ripe enough to grow.

Percy.—Seeded April 21. July 7 it had made but slender growth, although rather better than the Black Sea. It was 2 feet high. July 22 it still appeared backward and was beginning to head and averaged

2½ feet in height. August 5 it had fully headed and was in bloom. August 26 the berry was in the milk. September 25 it was in the dough and beginning to turn. October 10 it was ripe enough to grow and was cut.

Chile.—Seeded April 21. July 7 it measured 30 inches and had made a strong, leafy growth. July 22 it was nearly all headed out and measured 3 feet high. August 5 it was in full bloom. August 26 the berry was in the milk; September 25, in the dough and beginning to turn. The straw was coarse, the heads large. October 10 it was ripe enough to grow.

Pruyles Champion.—Seeded April 21. July 7 it had made a good growth, measuring 30 inches. July 22 it was apparent that the straw was comparatively light and fine and that the plants tillered abundantly. It was nearly all headed out and measured 2½ to 3 feet. August 5 it was in bloom. August 26 the berry was in the milk and in some of the more advanced head in the dough. September 25 most of it was still in the dough, but beginning to turn. It was a handsome wheat. October 10 it was ripe enough to grow.

Red Fife and White Fife.—Two varieties which were grown under the same conditions, but failed to ripen. October 10, when the first killing frost occurred, they were still green.

A patch of winter wheat was seeded in the fall of 1898 on the cleared ground on Japonski Island, but it was completely winter-killed, probably because the ground was poorly drained and became water-logged, and there is, therefore, nothing to report concerning winter wheats for the present season.

SPRING RYE.

A small quantity of spring rye was seeded April 21 under the same conditions as the foregoing varieties of wheat. July 7 it had made a vigorous growth and was thick in the row. July 22 it was all headed out and measured from 4 to 5 feet in height and the heads were 3 to 5 inches long. August 1 it was beginning to bloom and measured 6 feet. August 26 the berry was formed, but not fully grown. On September 25 it was still in the soft dough. October 10 it was barely ripe enough to germinate.

WINTER RYE.

Mr. Thomas Baker, at Hootz Bay, near Killisnoo, concerning whose farm I shall have more to say on another page, was furnished with a few quarts of winter rye by the writer in the fall of 1898. This he seeded early in September. It came through the winter in good shape and grew to a height of from 6 to 7 feet, and matured a fine crop by August 25. There is, therefore, no doubt but that winter rye can be grown in the coast region of Alaska. (Pl. III.)

BARLEY.

Beartown.—A variety of barley from Norway imported by the United States Department of Agriculture in the winter of 1897–98. It was grown at Sitka in 1898 and matured perfectly. The crop here referred to was grown from seed raised at Sitka in that year. Seeded April 21. July 7 the following note was made: It is the finest variety in the whole patch; thrifty and very promising, averaging 3 feet in height. July 22 it was fully headed out, of excellent color, and the heads were large. August 1 the grain was in the milk and the patch presented a

FIG. 1.—RYE, BARLEY, BUCKWHEAT, AND FLAX GROWN IN ALASKA, 1899.

FIG. 2.—VARIETIES OF BARLEY GROWN AT SITKA, 1899.

very promising appearance. It averaged 5 feet in height. August 30 it was ripe and was then harvested and left to dry. (Pl. III.)

Perm.—A Russian variety from the Province Perm, imported by the United States Department of Agriculture in 1897, and, like the foregoing, grown at Sitka in 1898. Seeded April 21. July 7 it was slightly less vigorous than the preceding variety, measuring but 30 inches, but it was healthy and leafy. July 22 it was all headed out and most of it past bloom, measuring about 4 feet. The heads were large and gave promise of a good crop. August 1 the grain was in the milk, the straw measuring 4½ feet. August 30 it was fully ripe and was then harvested. (Pl. III.)

Manshury.—Seeded April 21. On July 7 the following note was made: It is vigorous and promising and, next to Beartown, the best in the patch. It has tillered abundantly; the straw is stiff; leaves upright. The best measures fully 3 feet. A few heads are beginning to show. July 22 it was nearly all past bloom. The straw was coarse and strong; the heads large. August 1 the grain was in the milk, and on September 2 it was fully ripe and was then harvested. (Pl. III.)

The three preceding varieties are the most promising that we have so far grown at the station. All are six-rowed. The Manshury is a common American variety, the seed of which can be obtained from almost any seedsman in the North. They are all earlier and appear better adapted to Alaskan conditions than the following:

Improved Cheyenne.—Seeded April 21. July 7 it had tillered abundantly and was rather promising in appearance. The best measured 2 feet. July 22 it was uneven in height, measuring from 2 to 3½ feet. It was then headed out. The straw was rather heavy. August 1 it was just beginning to bloom. September 25 it was ripe enough to harvest and was a fine grain, which would rank well in the market. (Pl. III.)

Canadian Thorpe.—Seeded April 27. July 7 it was spindling and uneven, but some of it measured 2 feet. July 22 it was all headed out and measured from 2½ to 3½ feet. August 1 most of it was still in bloom. It did not ripen fully until October 1. (Pl. III.)

Two-Rowed.—A variety received under this name and much resembling Improved Cheyenne. It was seeded April 20. July 7 it appeared to be fairly vigorous and had tillered abundantly. July 22 the stand was even and the growth vigorous, the straw being quite heavy. It was then headed out and measured 3 feet in height. August 1 it was just beginning to bloom. September 25 it was ripe enough to harvest. (Pl. III.)

Royal.—Seeded April 27. July 7 it did not appear extra vigorous, though some of it measured 2 feet in height. July 22 it was all headed out and measured 2½ to 3 feet. It ripened about September 30. It did not appear to be a very desirable variety. (Pl. III.)

Oderbruch.—Seeded April 25. July 7 it had attained a height of 18 inches. July 22 it was noted that the stand was light and the straw slender. It was all headed out and measured 3 feet. August 1 the grain was formed. It was ripe enough to grow the last of September. (Pl. III.)

Petschora.—Seeded April 27. July 7 it was noted that it did not appear to tiller and was rather weak. July 22 the stand was light and the straw slender. It had all headed out and measured 2½ feet. It was ripe enough to grow October 1, but could not be considered a commercial article. (Pl. III.)

Trooper.—Seeded April 25. It did not make a good straw. July 7 it appeared spindling and showed signs of rust. The best measured

only 18 inches. July 22 it had headed out and improved much in appearance, measuring from 3½ to 4 feet. August 1 the grain was in the milk. September 5 it was ripe. (Pl. III.)

Black Hulless.—Seeded April 27. July 7 the color was poor. The plants apparently did not have leaves enough for vigorous growth. July 22 the stand was light and the straw slender and somewhat affected with rust. It was fully headed out, but the heads were very short, but few measuring more than 2 inches in length. August 1 it was in the milk and measured 3 feet high. August 30 it was ripe and harvested. This variety is quite early, but a very light yielder, and on that account can not compete with Manshury, Beartown, and Perm. (Pl. III.)

Smooth Hulless.—A small early variety which matured August 30, but the growth was spindling and the yield very light, and on that account it is not to be recommended. (Pl. III.)

Guy Male.—A small early variety, which proved a complete failure. The growth was very light and the heads which formed failed to produce seed.

OATS.

[See Pl. IV.]

With one exception, all the varieties of oats which so far have been tried at the station matured later than the barleys. This exception is—

Finland Black.—A variety imported from Sweden by the United States Department of Agriculture. Only a very small quantity of the seed was received. It was seeded May 2 and grew vigorously from the start and was ripe enough to harvest August 30. An effort will be made to propagate this variety so as to obtain a stock of seed.

Nameless Beauty.—Next to the preceding, this was the earliest variety grown the past year. It was seeded April 21 and grew with great vigor. July 7 it measured 2½ feet. July 22, when it was just beginning to show heads, it measured 3½ feet. It was ripe enough to harvest September 15, at which time it was between 5 and 6 feet high and gave a very satisfactory yield.

The following varieties showed very little difference in point of earliness. They were all harvested September 25 in about the same state of maturity. All were seeded April 21 and all showed about the same vigor. There is therefore but little choice between them.

White Russian, grown from seed raised at Sitka in 1898.

Improved Ligowa, grown from seed raised at Sitka in 1898.

Siberian.

Race Horse.

Early Gothland.

White Wonder

Perm, a variety received from the Province Perm, Russia, and grown from seed raised at Sitka in 1898.

Duppaur, imported from Norway in 1897 by the United States Department of Agriculture. Grown from seed raised at Sitka in 1898.

Abundance.

Banner.

Early Archangel.

The following varieties were barely ripe enough to grow October 10, when the first killing frost occurred: Bonanza, White Schonen, and Welcome. And the following failed to mature: Wide Awake, Prize Cluster, and Flying Scotchman. No variety can be recommended for that region which does not mature before the end of September.

VARIETIES OF OATS GROWN AT SITKA, 1899.

FIG. 1.—VIEW OF EXPERIMENTAL PLATS IN GOVERNOR BRADY'S GARDEN, SITKA, JULY 7, 1899.

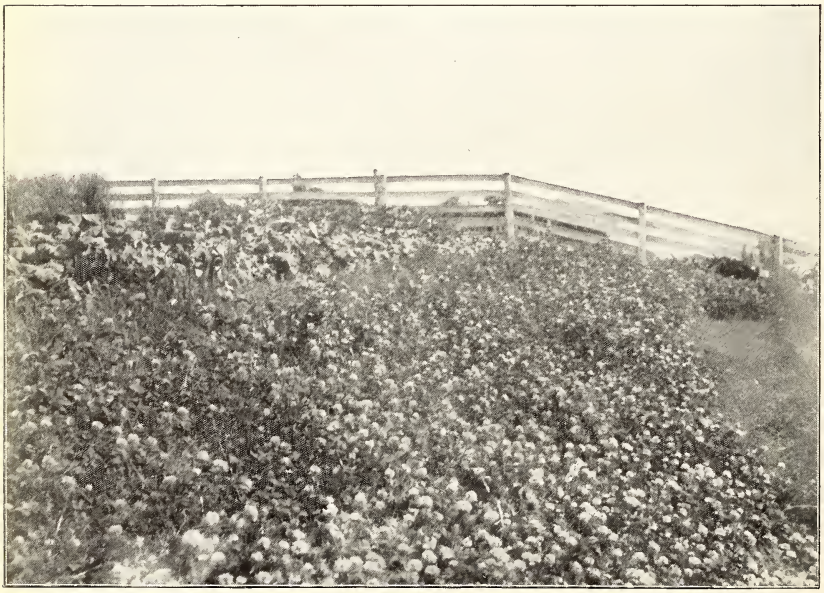


FIG. 2.—RED CLOVER IN BLOOM, SITKA, 1899.

FORAGE PLANTS AT SITKA.

Red clover, alsike clover, and white clover were seeded in the spring of 1898. They all made a vigorous growth during the summer of 1898, but there was some doubt about their surviving the winter, especially the red clover. I was therefore much gratified to find them all alive in the spring of 1899. As in the preceding year their growth during the season was remarkably vigorous. They all bloomed profusely and the early heads of all three sorts produced seed ripe enough to grow before frost. (See Pl. V.) There is not the slightest doubt whatever but that red clover will do well anywhere in the coast region of Alaska provided the soil is drained and otherwise in proper condition.

Other forage plants grown at Sitka last year were rape, *Vicia villosa*, *V. sativa*, *Spergula maxima*, *Anthyllis vulneraria*, *Ornithopus sativus*, and the blue lupine. The rape did particularly well. It is adapted to the cool summer, and can always be depended upon to furnish a good yield. It is especially valuable for sheep feed. The vetches grew vigorously and yielded a large amount of forage. The other plants, although they made a fair growth, did not compare with the vetches in the amount of feed produced.

Of grasses, timothy, Kentucky blue grass, *Avena elatior*, and velvet grass (*Holcus lanatus*) were seeded and all grew well. Timothy perpetuates itself readily, as it may be seen in several dooryards where it has been for years.

PEAS AND OATS.

A portion of the cultivated ground on Japonski Island was seeded to a mixture of Siberian oats and yellow field peas on June 12, the object being to raise forage for the oxen. The crop was therefore seeded rather thickly. The result was a very heavy crop, which covered the ground to an average depth of about 2 feet. It was cut August 23 in order to go into the silo, which was then being filled. At that date the peas were in bloom and the oats heading out. A mixture of oats and peas is one of the most nutritious green feeds the farmer can grow, and the indications are that there are but few, if any, forage crops which can be grown in Alaska as a catch crop to better advantage.

BUCKWHEAT.

Silver Hull.—Seeded on Japonski Island. Failed to mature seed, partly because the growth was too rank and partly because the seed was grown too far south. It was bought in Seattle and was probably raised in California.

Imported Siberian.—A small quantity of this variety was furnished by the Department and it matured seed, although the plants were stunted. Buckwheat from Maine matured seed by the latter part of September. It will probably be necessary to develop a variety of buckwheat especially adapted to the climate before we can count with certainty on this crop.

At Kenai, both Silver Hull and Siberian matured seed, as noted elsewhere. (See Pl. III.)

FLAX.

Riga.—A patch of the Riga flax was grown again last season and, as the year before, made a rank growth. It was in bloom July 22 and matured seed September 20. As heretofore, it produced a fine quality

of straw for fiber, and there is no doubt whatever but that Alaska is well adapted to flax growing. The bundle of flax shown in Pl. III was grown at Kenai.

VEGETABLES AT SITKA.

Vegetable growing is no longer an experiment in the coast region of Alaska. Very successful market gardens are carried on at Juneau and in Hootz Bay near Killisnoo, where all the hardy vegetables are grown with marked success. My efforts at vegetable growing at Sitka were, therefore, much restricted the past season. Small quantities of the following were seeded:

PEAS.

Edible Pod, Grant Sugar, Earliest of all Alaska, First and Best, and Large Marrowfat.—Peas grow extremely well in Alaska, and all of these were very successful. The Edible Pod and Grant Sugar attained a height of 8 feet.

BEETS.

Eclipse, Blood Turnip, Golden Tankard, Large Red Mangel.—The two first-named varieties are for table use and the two latter for stock feeding. All grew well, though none of them attained remarkable size. There is much complaint that beets frequently run to seed before the root is properly developed. I have observed the same characteristic, but can not say at this time whether it is due to the seed or to some inherent quality of the soil. Probably it is chiefly the fault of the seed.

CARROTS.

Scarlet Horn, Champion, and Yellow Stock.—The latter is especially adapted for stock feeding. All three varieties grew well. (Pl. VI.)

PARSNIPS.

Hollow Crown.—Produced large, tender roots.

SALSIFY.

The roots branched too much to be rated as first class, but the plants were vigorous and evidently well suited to the climate.

ONIONS.

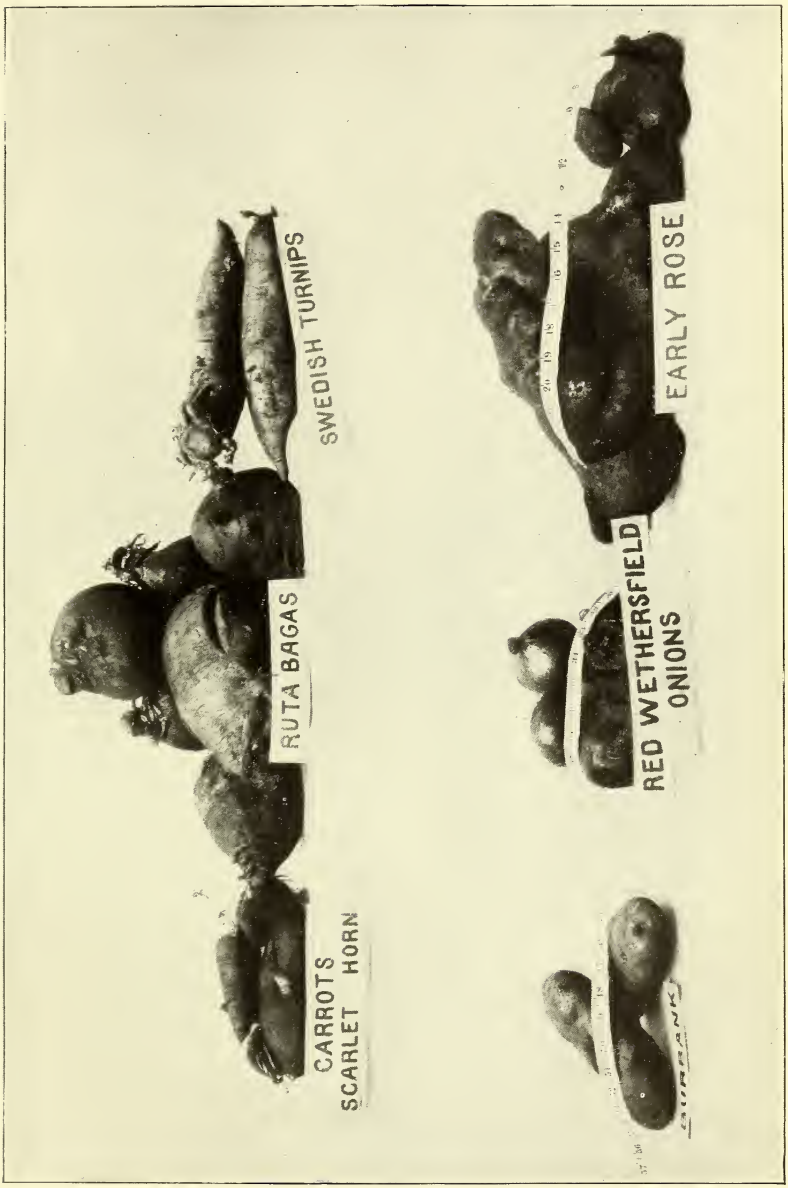
Large Red Wethersfield.—The onions produced by this variety were small. This, however, was due to the seed or to the soil where they were grown. I have seen very large onions grown elsewhere in Alaska. Those shown in Plate VI are fine specimens, grown on Mr. Baker's farm, Hootz Bay.

SPINACH.

Monstrous Viroflay.—A large-leaved sort, which did well in Alaska the past season. In the summer of 1898 spinach proved almost a total failure. This was due probably to the seed.

PARSLEY.

Triple Curled.—It grew very vigorously, produced an abundance of leaves, and the plants from the crop of 1898 wintered successfully in the garden without protection.



CARROTS, RUTA-BAGAS, TURNIPS, ONIONS, AND POTATOES GROWN IN ALASKA, 1899.

FIG. 1.—CAULIFLOWERS, TURNIPS, BEETS, CABBAGES, AND POTATOES GROWN AT HOPE CITY, TURN-AGAIN ARM, COOK INLET, 1899.

FIG. 2.—WINDSOR BEANS AND WAX BEANS, SITKA, 1899.

RADISHES.

Long Scarlet and French Breakfast.—The French Breakfast radishes, seeded April 24 in the open were large enough to use by June 19.

TURNIPS.

All varieties of turnips grow perhaps better in Alaska than anywhere else in the United States. Specimens sent down to Sitka from Turn-Again Arm, Cook Inlet, by Mr. F. Roll, a merchant much interested in horticulture, measured 10 inches in diameter. (Pl. VII, fig. 1.) At Sitka all varieties so far tried have done well. The following varieties were grown: White Milan, White Globe, and Long Swedish. (Pl. VI.)

RUTA-BAGAS.

Bangholm Yellow.—This was the only variety grown, but all varieties of ruta-bagas grow extraordinarily well, roots not infrequently weighing as much as 10 pounds. (Pl. VI.)

BEANS.

String and pole beans can not be successfully grown in Alaska. The summers are too cool for their best development. Nevertheless, both Golden Wax and Black Wax beans produced edible pods the past season at Sitka, but the yield was light and the crop can not be called a success.

Windsor Beans.—The Windsor bean (*Vicia faba*), a variety which is quite common in England and continental Europe, but grown to only a limited extent in the United States, succeeds well at Sitka. It was grown both last year and the present season, and both years produced an abundance of pods with fully developed beans, the plants attaining a height of 4 feet. This bean can take the place of the common garden bean. The pods are not eaten. The seed is used like lima beans, from which it can scarcely be distinguished when cooked. Plate VII, fig. 2, is reproduced from a photograph of these beans as they appeared early in September.

POTATOES.

All varieties of potatoes can be grown with marked success anywhere in the coast region, provided they receive proper care. Burbank, Early Ohio, and Early Rose are favorite potatoes with the settlers, and all do equally well. They frequently attain extraordinary size, single potatoes often weighing as much as 2 pounds. The quality is nearly always first class. The Early Rose potatoes shown in Plate VI were grown at Sitka by the Rev. Mr. McClelland, of the Presbyterian Mission. The largest measured 9 inches long and weighed $2\frac{1}{4}$ pounds. One hill produced five large potatoes, weighing nearly 2 pounds each, besides seven of average size, and several smaller ones.

FLOWERS AT SITKA.

The station has not as yet experimented with the cultivation of flowers except a few annuals obtained from the Department of Agriculture and comprising sweet peas, petunias, larkspurs, portulacas, and pansies, all of which did well. That ordinary garden flowers will do well in Alaska may be seen from the following list which the writer

found in bloom August 11, 1899, in Mr. W. M. Reinhard's market garden at Juneau. He grew them for market and found them profitable.

1. Sweet peas, in many varieties and all very fine.
2. Nasturtiums, likewise in many varieties.
3. Alyssum.
4. California poppy (*Eschscholtzia californica*).
5. Forget-me-nots.
6. Chinese pinks (*Dianthus chinensis*).
7. Cornflowers (*Centaurea cyanus*).
8. Pansies, in great variety and all most excellent. Pansies do especially well in the cool, moist climate of Alaska. They bloom profusely and continously all summer.
9. Petunias.
10. Sweet William (*Dianthus barbatus*).
11. Ten Weeks Stocks (*Matthiola annua*), in large variety and very fine.
12. Snapdragon.
13. Marigold.
14. Dahlias.
15. Daisies.
16. Golden Feather (*Pyrethrum parthenifolium*).
17. Salpiglossis (*Salpiglossis sinuata*).
18. Hollyhocks.
19. Poppies.
20. Larkspur.
21. Carnations, planted out from the greenhouse.
22. Balsam (*Impatiens balsamina*).
23. Phlox.
24. Mignonette.
25. Aster.
26. Verbena.
27. Gaillardia.
28. Portulaca.
29. Mimulus.
30. Maid of the Mist.
31. Fuchsia, planted out from the greenhouse.
32. Everlastings (*Helichrysum*).
33. Everlastings (*Gnaphalium*).
34. Lobelia (*Lobelia erinus*), planted out from the greenhouse.
35. Ground cherry (*Physalis*).

All of these were in bloom on the date named. They gave convincing evidence that flowers can be grown in Alaska. The varieties of sweet peas were especially numerous, luxuriant, and profuse in their bloom, and the same may be said of the nasturtiums. This is proof positive that Alaskan settlers who are lovers of flowers can gratify their tastes in this direction also.

LENGTH OF SEASON.

The snow disappeared from the ground at Sitka the past season in the latter part of March, but remained in places sheltered from the sun, such as on the north side of fences and buildings, until the latter part of April. Gardening operations began about April 20, after which date there was no severe frost and the first killing frost in the fall did not occur until October 10. October 9 flowers were in bloom in many private gardens in Sitka. (See Pl. VIII, fig. 1.) It will therefore be seen that the season was as long or even longer than it is in the central United States.

FIG. 1.—VIEW OF GARDEN AT SITKA, OCTOBER 9, 1899, SHOWING FLOWERS STILL IN FULL BLOOM.

FIG. 2.—A SETTLER'S CABIN, SITKA.

CROPS FAIL ON NEW GROUND.

The experience of last year on this point was confirmed the present season. Grain and vegetables of every description seeded on new ground, which had not been broken up or cultivated before, were either total failures or the growth was so poor as to amount to a failure. The writer obtained the use of a patch of new ground about half an acre in extent. A portion of it had been cultivated one year. The remainder had not been cultivated. This ground appeared porous and friable. It was easily worked. Oats and barley of several varieties and buckwheat and peas were sown on this patch May 18. The seed germinated promptly, but on the ground which had not been cultivated it was very sickly and more than half of it died. That which remained did not exceed 7 to 8 inches in height at the close of the season, although the oats attempted to set seed. The ground that had been cultivated the year before gave somewhat better results, but the growth was stunted and the yield very light. Oats appeared to do better on such ground than barley, which was to a large extent a failure. The peas and buckwheat did no better.

THE EFFECT OF LIME.

An experiment in liming this new soil was tried. Quicklime at the rate of 2 tons to the acre was applied to a strip running across a series of plats seeded to oats, barley, buckwheat, and peas. The result was an increase in growth of from 50 to 200 per cent over that on the land which was not limed. As might be expected, the lime had the most marked effect on the peas. On the unlimed ground they were thin and not over a foot high, while where the lime was applied the stand was good and they measured 2½ to 3 feet. The barley, likewise, showed a decided improvement where the lime was applied. Where there was no lime it was almost a failure. Buckwheat came next and showed an increase in growth of from 50 to 75 per cent, and lastly oats, also showing an improvement, but not so marked. The limed strip was distinctly noticeable to the casual observer.

It was demonstrated in the soil tests last year that new land is acid. Lime is the most efficient remedy. Experiments with lime on a larger scale are planned.

SOD GROUND NOT PRODUCTIVE.

One of the patches which was cultivated the past season had been in sod for seven or eight years, although it had formerly been used for the growing of vegetables. This sod was broken up with the plow and reduced with a disk harrow. The crops grown on this ground presented some of the characteristics noted on new ground. The barley was short and sickly and failed in patches. Flax proved a failure, attaining a height of only 8 or 9 inches. Field peas, wheat, and oats, on the other hand, grew better, but not so well as they did on ground which had been under constant cultivation for some years. It will be one of the problems of the experiment station to discover the cause and remedy for the unproductiveness, not to say poisonous nature, of new ground.

FILLING THE SILO.

By arrangement with Governor Brady I was permitted to use his silo for the double purpose of experimenting in the preservation of native grasses as silage, and also in supplying forage for winter for the yoke of oxen owned by the station. With this end in view we began

filling the silo August 21. For this purpose we cut and gathered the native grasses which are found in greater or less abundance at several places on the beach. Unfortunately there was but little of this grass to be found close to Sitka. We had to bring it in boats from places some of which are between 5 and 6 miles distant. This proved to be a laborious task and not altogether satisfactory, as the silo was filled rather too slowly. However, the work was much facilitated through the courtesy of Capt. W. F. Kilgore, of the United States revenue cutter *Perry*, who kindly permitted the use of his steam launch to haul a scow load of grass from a bay about 6 miles distant to the silo. If it had not been for this opportune assistance it is doubtful if we could have secured sufficient silage to last through the winter, as it took too long to carry it that distance in rowboat lots. As it was, however, sufficient was secured to last until spring. This beach grass consisted chiefly of *Elymus mollis*, a grass which attains a height of about 4 feet. It is rather coarse, but cattle eat it readily. It grows on flats where the spruce has not yet driven it out and extends from the edge of the forest to the high-water limit. If there was an abundance of this grass the region could not be surpassed as a stock country; but, as stated, in southeastern Alaska this natural forage is limited to patches along the beach which in the course of time have been raised above high-water mark. I have never seen it away from the beach.

The grass was too long to settle sufficiently close in the silo, even when carefully tramped down. The settling was therefore facilitated by the use of a hay knife. Each successive layer of about 2 feet in thickness was cut through in both directions by making cuts some 6 to 8 inches apart. It could then be tramped down more compactly, resulting in fewer air spaces and better chances for successful preservation.

MANY SILOS HAVE BEEN BUILT.

Owing to the difficulty of making good hay because of the frequent rains, the silo will undoubtedly be the most practicable means for preserving winter forage in coast regions of Alaska. This fact is generally recognized by those settlers who keep cattle, and many of them have already constructed silos. Governor Brady built his silo in 1898. Mr. W. W. Warne, the missionary in charge of the Presbyterian Mission at Haines, built a very substantial concrete silo some years ago. Mr. Thomas Knudson, a farmer near Juneau, built a silo last year. Rev. Mr. Johnson, at Yakutat, has a silo; Rev. Mr. Coe, of the Baptist Orphanage on Wood Island, near Kadiak, built a silo in 1898; and Capt. F. F. Feeney, of Kadiak, also built a silo last year, and many others have either built or are about to build silos. All this indicates that the settlers fully appreciate the silo and intend to make the best use of it. Hay can of course be made under very adverse circumstances by taking advantage of every hour of sunshine, by frequent handling, and gradually enlarging the haycocks, and by protecting them, as far as possible, from rain by the use of covers; but this involves a very large amount of work and when made the hay is at best of mediocre quality. The silo makes it possible to preserve good feed even in rainy weather. When the grass has reached the proper stage it can be cut and placed in the silo regardless of the weather.

EXPERIMENT IN FEEDING SILAGE.

Realizing the important position that silage was destined to occupy in that region, I induced Mr. Thomas Knudson, a farmer who has made his home on the flat below Mendenhall Glacier, some 8 miles from

FIG. 1. VIEW OF LAND BEFORE IT WAS CLEARED, EXPERIMENT STATION, SITKA.

FIG. 2.—CLEARING LAND AND BURNING STUMPS, EXPERIMENT STATION, SITKA.

Juneau, to build a small silo in his barn last summer and to fill it with the grasses that grow abundantly all about him. The agreement was that he should feed the silage thus made to at least three head of cattle and to two head of horses during the winter. Letters from Mr. Knudson bring out the following facts:

Construction of the silo.—The silo was built inside of his barn, which happened to be so large that the space required for the silo could be spared. This, of course, obviated the necessity of putting a roof on the silo and also an outside covering. The silo was 12 by 12 feet square, 13 feet high. The sills were bedded in cement so as to make it perfectly tight. On the sills studding 2 by 6, 18 inches apart, was erected. The inside was then covered with a layer of ship lap, over which was secured a double layer of tar paper, and over this another layer of ship lap. The lumber, cement, and nails cost $62, with rough lumber at $16 per thousand, ship lap at $18 per thousand, and cement at $4 per barrel. Tar paper was $1.75 per roll. The carpenters' wages were $4 per day and board, which made a total of $25 for labor in building it. It cost $10 to tow the lumber from Juneau to the farm. The total cost was $97.

The silo was filled entirely with native grasses, consisting chiefly of wild rye. Mr. Knudson began to fill it August 16, and finished August 29. One man was kept inside of the silo all the time it was being filled, tramping the grass down thoroughly. It rained part of the time this work was going on, and Mr. Knudson remarks that the grass which was put in during the rain kept better than that which was dry. (Other things being equal, there is no apparent reason why the wet grass should keep better than that which was not wet.) Mr. Knudson opened the silo November 25, and from that date until March 20, by which time the silage had been consumed, he fed two feeds a day to two horses and three cows and two yearlings. At noon he gave the cows a little hay, in order to save the silage. He states that for some time he fed silage exclusively, and that during this time there was a decided improvement in the flow of milk. But, as he was short of silage, he was later obliged to substitute hay for the noon feed. The horses were worked every day, and in addition to the silage they were fed grain three times a day. Mr. Knudson remarks that his only regret is that he did not build a larger silo. He is thoroughly satisfied with the results as far as the quality of the feed is concerned, but his silo is not large enough to feed his increasing herd during the winter, and he plans to enlarge it. The mass of the silage kept perfectly, and was sweet and palatable to the cattle when fed, but, the grass being long, it did not spread to the sides in settling, as cut silage will, which admitted air in places. For this reason it was more or less moldy at the corners and around the sides, and a thin layer on top was also spoiled. Mr. Knudson estimates the total waste at about 4 tons.

CLEARING LAND AT SITKA.

Some difficulty was experienced in obtaining hands to clear land at Sitka, and it is to this chiefly that but little was accomplished in the way of clearing until the latter part of June. The work was continued during July and August. Altogether 6 acres of land have been cleared. The work is expensive. The cheapest hands could not be hired for less than $2 per day. Others were paid $2.25 and $2.50. The stumps stand very thick. An idea of the character of the land and the nature of the work may be obtained from the illustrations herewith inserted. (Pls.

IX, and X). July and August were dry enough to admit of burning the stumps and roots which were dug up. This not only saved the expense of hauling them away, but the ashes also furnished some fertilizer for the soil. The roots do not run deep into the ground. They are chiefly near the surface, and can, therefore, be dug out without going very deep. A hand stump puller which was brought up proved to be too light for the work. It requires a large machine to handle these stumps to advantage.

It would, of course, have been desirable to locate the station on ground which did not require clearing, but unfortunately there is no such land in the neighborhood of Sitka. The timber was removed from the tract now set aside for the station some fifty or more years ago, and it has since grown up with small spruce, huckleberry bushes, and other low shrubbery, and the whole surface of the ground is covered with a thick layer of moss, but the old stumps, although much decayed, still remain. The accumulation of vegetable matter, which has probably gone on for many centuries, has formed a layer of peat-like substance which, in places, is 3 or 4 feet deep, or even more, while in other places it is scarcely a foot thick. Below this layer we find either a glacial clay, containing more or less gravel, or a mixture of gravel and sand, with comparatively little clay.

DRAINAGE.

This peat formation holds water like a sponge and thorough drainage is necessary before it can be put in condition for cultivation. Narrow ditches 3½ or 4 feet deep have, therefore, been dug on a portion of the cleared land; but open ditches are impracticable, especially since they must of necessity be close together and follow the contour of the ground and can not, therefore, be parallel. To import drain tile is impractical because too expensive; no settler could incur such outlay, and stones are rarely present in sufficient quantities to be used as drains. So, as the next best plan, brush drains have been constructed and, so far, appear to be very effective. The ditches were packed with short brush, set at an angle of about 60°, leaning upstream, and butt end down. The mass was packed down so as to be beyond the reach of the plow and, when necessary, sod or moss was laid on top of this brush; and, finally, the ditch was leveled. Such drains are probably the least expensive that the settler can construct, and they will answer the purpose effectively for many years. The little scrub pine which grows abundantly there is well adapted to this use. Any enterprising settler can construct a brush drain for himself, and he can thus gradually improve his land without outlay for drainage material.

The surface of the station land at Sitka is very uneven. Numerous small hillocks, deposited by the melting of ancient glaciers, are scattered all over the tract. Some of these are so steep that it is necessary to level them, at least in part, and between them are deposits of peat often several feet thick, which must be drained.

CHARACTERISTICS OF PEAT LAND.

The southern boundary of the station tract runs across a portion of the peat bog which lies directly back of Sitka and which is generally referred to as Baranof Swamp. It borders on the higher hillock land above referred to and on which most of our work has been done.

FIG. 1.—PEAT FORMATION, EXPERIMENT STATION, SITKA.

FIG. 2.—AT WORK ON THE EXPERIMENT FARM, SITKA.

These peat bogs are not necessarily perfectly level. Originally the retreating glaciers seem to have left shallow depressions in stretches of comparatively level surface, in which water collected and vegetation started. The semiaquatic vegetation decayed and gradually filled up the depressions. The dense growth of moss would hold water like a sponge, and thus wherever the moss obtained a foothold, even on sloping ground and low hills, the wet climate, supplemented by the moss, would produce a growth of swamp plants which, on decaying, formed peat. This resulted in the formation of peat even on hillsides and rising ground. The process may be seen going on to day. As they now appear, these peat bogs are covered with a thick growth of moss (several species of Sphagnum and other mosses), and in patches many species of woody, trailing, and low shrubby plants, prominent among which are the crowberry (*Empetrum nigrum*) and two species of cranberries (*Oxycoccus oxycoccus* and *Vaccinium vitis-idæa*.)

Small clumps and isolated individuals of a low scrub pine (*Pinus contorta*) are scattered about; but there are no large trees, nor stumps to indicate there have ever been any. There are numerous small muddy pools, only a yard or two across, united by narrow meandering water courses through which the surplus water finds an outlet to lower ground, generally into a small lake, or, if near the coast, into the sea. Grasses and herbage, valuable for stock feed, do not grow in these places. This peat formation, with some modification, is found also on higher ground, in the woods, and under the trees on knolls and hillsides; but it is a secondary growth induced by the moist climate. The trees are always rooted in the soil, indicating they were there first, or at least contemporaneously with this semiaquatic vegetation.

The upper layer of the moss to a depth of about 6 inches is alive and growing. A handful of it, pulled up, even on higher ground and in dry weather, contains so much water that it can be squeezed out as from a sponge. Below this living layer the dead moss is still intact. Indeed it is difficult to determine where the dead ends and the living begins. At the depth of a foot or a foot and a half the stems and fibers are still distinct, but the moss is so far decayed that it is readily cut and turns black and crumbles on exposure to the air.

EXPERIMENTS IN IMPROVING PEAT LAND.

Since a large proportion of the level land and valley land of Alaska is of this peat formation, it is eminently desirable that the station should experiment with its improvement. We have, therefore, cleared some 2 acres of this character and begun to drain it. In fig. 1, Pl. X, the foreground shows a portion of the peat bog on the station land on which the moss and vegetation have been thrown into windrows.

This land can be cleared at much less expense than the stumpy ground. The clearing consists only in removing the moss, trailers, and low shrubs. But this has to be done by hand, because the peat is too soft for either oxen or horses to work on it. We found a large hoe made for the purpose, nearly a foot across the face, with a sharp edge, and handle at an acute angle, to be a convenient tool. By driving it in under the moss about 6 inches deep, the surface is pared off and then thrown into windrows with a view to burning it; but it did not get dry enough for that. It will either have to be hauled off or thrown into large piles and these left to decay. It was noticeable that the surface dried out comparatively rapidly between rains where the moss was

removed, but it continued too soft to bring on work animals. Next, ditches were dug 15 feet apart, all discharging into a head ditch, and these ditches will, the coming spring, be packed with brush as already described. The situation admits of thorough drainage. In northern Europe, peat bogs, which are not wanted for fuel, are often converted into fertile fields, and I have no doubt that many Alaskan peat bogs can be similarly converted. To do it they must be elevated enough to permit of thorough drainage, and when the drainage is complete one or more heavy dressings of quicklime will be needed to neutralize the acid in the peat and hasten decay. It will take time and patient work, but once reclaimed they will yield heavy crops and will be especially adapted to forage plants and crops where rank growth is desired.

NO FARMS READY MADE.

The settler in the coast region in Alaska will at the outset be confronted with the task of clearing and draining his land. In many places desirable small tracts of land can be found which do not require clearing; but these are few and far between. In most cases the ground is covered with spruce forests or other woody vegetation which must be grubbed out. This task is laborious and slow and the likelihood is that where the ground must be cleared farms will be small and devoted chiefly to the growing of vegetables and forage for live stock. In some places the soil is gravelly and will not require underdrainage, but in most localities underdrainage will also be found necessary. People who have heard of the depth to which the ground freezes in the interior of Alaska sometimes assume that this condition also prevails in the coast region. This, however, is a mistake. In the coast region the ground rarely freezes to a greater depth than 1 foot, and this only in exposed places. The winters are mild in comparison with the winters of our Northern States, and the heavy growth of moss, together with the snowfall, often prevent the ground from freezing at all. There is, therefore, no frost to contend with in clearing and draining the ground.

HEADQUARTERS BUILDING.

In compliance with instructions, I advertised for bids for the erection of a headquarters building at Sitka on the site known as Castle Hill and reserved for that purpose last year by order of the President. The plans and specifications furnished by the Department called for a frame building 43 feet 4 inches by 30 feet 2 inches, exclusive of porches, two stories high, to be built on a stone foundation, and plastered. I experienced some difficulty in getting bids. Bids were advertised for in Seattle, Skagway, and Sitka, and I sent copies of plans and specifications to many contractors. Nevertheless, bids came in slowly. The long time between mails and the impossibility of conveying an exact idea of the situation and local conditions by letter caused me to make a round trip to Juneau, Seattle, and Skagway, in order to personally explain these points to those who contemplated bids. For lack of funds to complete the building, the question was not what contractors would finish it for, but how much they would do along the lines of the plans and specifications for the amount available, viz, $3,700. Finally seven bids were obtained. On opening them it was found that Mr. George E. James, of Juneau, Alaska, was the lowest bidder, and the contract was therefore awarded to him. In order to get the building so far advanced

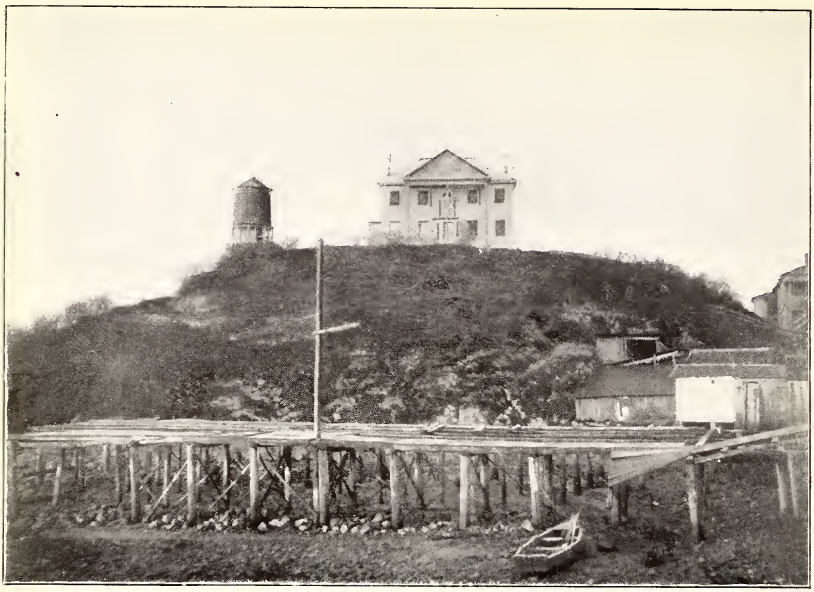


FIG. 1.—HEADQUARTERS' BUILDING AT SITKA—NORTH SIDE.

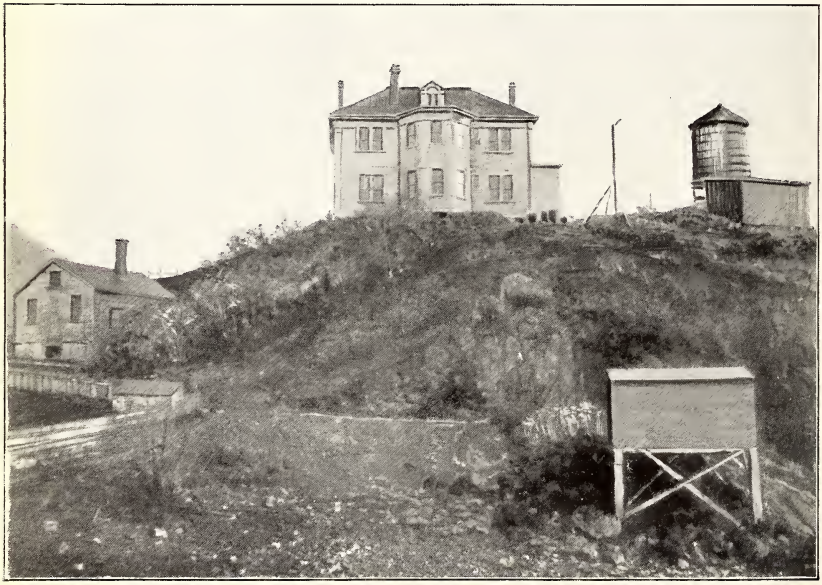


FIG. 2.—HEADQUARTERS' BUILDING AT SITKA—SOUTH SIDE.

FIG. 1.—HEADQUARTERS' BUILDING AT SITKA—WEST END.

FIG. 2.—ROAD LEADING TO TOP OF CASTLE HILL, SITKA.

that it could be used for office quarters and thus save the rent we had heretofore been paying, it was necessary to leave out nearly every feature that could be omitted and still get a structure on the lines of the plans, with a view to filling in these omissions as soon as funds are available. Thus, instead of a solid stone foundation, stone piers were erected which will answer for the temporary support of the building. The porches, both in front and rear, were omitted. The staircase from first to second story was omitted. Four flues and six fireplaces were omitted, and, of course, they can not now be put in. The cellar was excavated but otherwise left in the rough. No heating apparatus was put in and no plumbing whatever done. The second story was left entirely open without floor or loft and with only the studding set which was needed to support the roof. The railing on the roof and all ornamentation was omitted, and the building received but one coat of paint outside. The building as it now stands is, therefore, only a shell set on piers; with the rooms in the first story plastered and made habitable, but with bookcases and furniture of every description omitted. Plates XI and XII present different views of the building as it now appears.

Plate XII, fig. 1, shows an end view of the building and a portion of the steps leading to the top of the hill. It will be seen that the porch roof is supported by studding of a temporary nature. Plate XI, fig. 1, shows a view of the house from the north or side toward the land, and fig. 2 a view from the sea. The work as far as completed has been done thoroughly and substantially. The situation being a very exposed one, the structure has been anchored to the foundation by rods which run to the bottom of the piers. All the rough lumber is of native Alaskan spruce.

The plans were prepared by Mr. P. P. Flournoy, jr., draftsman, then of the Department of Agriculture, and when completed the building will answer admirably the present needs of the station. As planned, the lower story is to contain a laboratory, library, and offices and the second story quarters for the person in charge. The contract price for the work so far done is $3,700. Labor and material are at least 50 per cent higher at Sitka than on Puget Sound and twice as dear as in the East. I urgently recommend that the building be completed at the earliest possible date.

BUILDING ROADS.

It should be mentioned that among the other improvements at Sitka two roads have been built, one of them across the farm and the other from the street to the top of Castle Hill. The farm road became necessary in order to get to the portion where improvements are made. It leads across the marsh and crosses a small creek by means of a rough bridge. On the marsh "slabs" (first cut, or outside boards of logs) were laid down as a foundation, a lot of which were procured from a local sawmill. The work involved some grading.

The road up Castle Hill was made necessary, primarily, to haul sand and other materials for the building, but was also needed for the transportation of fuel, freight, etc. There was no practical way by which this road could enter from the street except through the custom-house lot. For this purpose permission was obtained from the Secretary of the Treasury, with the approval of the collector of the port, to go through one end of the lot. It involved going through one end of a woodshed belonging to the custom-house, which has been amended by

building a new and additional shed. It required some blasting to obtain a practicable grade, but a good road has been built. It winds about the north side of the hill, reaching the top at the south side of the water tank, and small loads can now be hauled over it, which is a great improvement on the practice of carrying everything up on men's backs. Plate XII, fig. 2, shows a section of this road taken from the custom-house lot.

WORK AT KENAI.

The reservation which was made last year at Kenai comprises 320 acres and is situated at the mouth of the Kenai River. It adjoins the little village of the same name. The Alaska Commercial Company has a store at the village and keeps an agent, and the Pacific Steam Whaling Company has built a salmon cannery about a mile from the village up the river. It is to some extent a landing place for hunters and prospectors, and the Post-Office Department established a post-office there last year, but otherwise the village itself has but little interest.

Assistant H. P. Nielsen was put in charge of the work there, with one man hired by the month to help him. He was provided with a yoke of work oxen and the necessary implements and tools. He arrived at Kenai with his outfit on April 24. A few days later (April 30) he reported the ground still frozen, though thawed out some 5 inches on top. His first care was to clear, break, and fence a piece of ground on which to grow some experimental crops. Half an acre was prepared for this purpose and ready to seed in the latter part of May, though a little of it was seeded earlier. On May 15 he reported that a soil thermometer 6 inches deep registered 37° F.

EXPERIMENTS WITH VEGETABLES AND SMALL GRAIN AT KENAI.

Mr. Nielsen constructed a cold frame soon after his arrival, in which he seeded cabbage, cauliflower, kale, kohl rabi, and Brussels sprouts. The resulting plants were planted in the open ground June 10 and 12. Beets, carrots, parsnips, lettuce, peas, radishes, potatoes, turnips, and ruta-bagas were seeded in the open May 20 to 26. Between the latter dates he also seeded oats, barley, spring wheat, flax, and buckwheat, also red, white, and alsike clover.

I visited the station in the latter part of July (23d). The buckwheat was then in bloom and everything else doing well. Considering that it was new, raw ground, which, as stated elsewhere, produces nothing at Sitka, all of these crops have made very fine growth. A photograph taken at that time and reproduced in Pl. XIII, fig. 2, gives an imperfect view of the experimental plats as they appeared in the latter part of July. In the foreground dwarf peas are in bloom; the middle ground shows the cabbages, etc.; beyond them are the clovers, and in the background grains, flax, and buckwheat. The tents beyond the fence belong to prospectors.

Under date of September 14 Mr. Nielsen reported: "We have cauliflower heads 14 inches across and large cabbage heads still growing. The natives do not know what they are, but white men smack their lips as they go by." Among samples he forwarded was a ruta-baga weighing 10 pounds. He reported that all the other vegetables had also done well.

FIG. 1.—SOUTHWEST CORNER OF EXPERIMENT STATION LAND AT KENAI.

FIG. 2.—EXPERIMENT PLATS AT KENAI.

FIELD CROPS AT KENAI.

WHEAT.

Romanow.—A bed 8 feet by 30 feet was seeded May 25 and a good stand secured, which made a fine growth, attaining a height of 5 feet. The kernels were in the milk when frost came. If it had been sown three weeks earlier, as it should have been, it would have matured. A short row seeded May 11 was ripe September 21.

BARLEY.

Russian, Beartown, and *Manshury.*—The Russian and Beartown were sown May 16, came up promptly, and were about 3 feet high by the 1st of July, when they began to head. Rain and wind during the last part of July and first part of August caused them to lodge badly, but they filled in spite of it, and were ripe by September 13, when they were cut.

The Manshury barley, seeded May 25, came up well, grew rapidly, produced good heads, and was ripe by September 13, when it was cut. Mr. Nielsen adds: "This is undoubtedly a good country for barley. I have never seen as large heads and grains anywhere. The barley raised here was nearly twice the size of the seed sown."

OATS.

Improved Ligowa, White Russian, and *Siberian.*—All three varieties did splendidly, reaching a height of 4 feet. Some of the panicles were nearly a foot long. All three varieties matured seed by September 15. There was no sign of rust and very little smut.

FLAX.

Riga.—A bed 8 feet by 60 feet was sown May 26 thickly for fiber. Apparently every seed grew, resulting in a fine stand which made a good growth, from 2 to 3 feet high, and by September 14, when it was pulled, about 75 per cent of the seed was ripe. (See Pl. III.)

BUCKWHEAT.

Siberian and Silver Hull.—Both varieties were seeded May 26. A bed of 8 feet by 75 feet of each was sown. The Siberian variety began to bloom by July 6, while the Silver Hull was at least two weeks later. Both varieties filled fairly well, but the Siberian was somewhat earlier and better matured. The Silver Hull made a wonderful growth of straw, some of it attaining a height of 3 feet. (See Pl. III.)

ALFALFA.

A bed 8 feet wide by 75 feet long was sown May 25. A good stand was secured and the plants made a good growth. It was mowed twice during the summer to keep the weeds down. No hay was taken off it, although when last mowed some of it was 6 inches high.

CLOVER.

Mammoth, red, white, and alsike or Swedish clover were seeded May 17. A bed 8 feet by 40 feet was sown of each variety. A fine stand was secured of each. The white and the alsike clovers were in full bloom by the middle of August. The red clover did not bloom, but was about 8 inches high just before frost, when it was cut and saved for hay.

VEGETABLES AT KENAI.

BEANS.

Golden Wax, *Black Wax*, and *Broad Windsor*.—The two varieties of wax beans did not sprout for nearly a month after they were planted, grew very slowly, and were just in bloom when frost came.

Broad Windsor.—This variety came up readily, grew well, and was full of pods well filled with beans. They did not mature, however.

BEETS.

Eclipse, *Blood Turnip*, *Long Red*, and *Golden Tankard*.—These were sown in drills 1 foot apart, and came up in about two weeks' time. The tops grew about 9 inches high and the beets were about 2 to 2½ inches in diameter. There was no choice between the different varieties.

CABBAGE.

Jersey Wakefield, *Early Express*, *Danish Ball Head*, and *Stone Mason*.—These were planted in a cold frame May 1, and transplanted to the garden in rows 2 feet apart and 18 inches apart in the rows on June 15. The Jersey Wakefield and Early Express produced very fine solid heads. The Danish Ball Head made a wonderful growth, some of the stalks being over 2 feet high, and the plants were crowded even at 2 feet apart each way, but they did not head. A few plants of the Stone Mason variety made heads, but they were loose and far inferior to the early varieties. The season was too short for the late varieties.

CAULIFLOWER.

Snowball and *Early Erfurt*.—Planted in the cold frame May 1, and the plants transplanted to the garden June 16. They grew well and made fine heads. Some of them were 14 inches across. The Snowball variety was a little the earlier, but the Early Erfurt was the finest in quality. Both kinds, however, were good. The first head was ready for the table August 6.

CARROTS.

Scarlet Horn.—A fine stand was secured, but the roots did not grow very large. Some of them were about 1 inch in diameter.

CRESS.

Curled or Pepper Cress.—Produced a splendid growth and was ready for use in a very short time. It grew about 2 feet high, and much of the seed matured before frost came.

KALE.

Scotch Curled.—Seeded in cold frame May 1 and transplanted June 15. The plants made a fine growth, some of the leaves being 18 inches in length and 7 inches in width.

KOHL-RABI.

Seeded in cold frame May 1 and transplanted June 15. The plants grew well and produced large bulbs. Five of them were weighed October 1, the aggregate weight being 22½ pounds. The largest weighed 5¼ pounds. They grew rapidly and were very tender and sweet.

LETTUCE.

Victoria Cabbage.—Seeded May 24, came up quickly, and was soon eady for use. Some fine, solid heads were grown. The leaves were ender and sweet the entire summer.

ONIONS.

Large Globe and Large Red Wethersfield.—These were sown from seed and some top sets. The top sets all grew, but worked out of the ground and died. The two varieties planted from seed grew much better than was expected. Many of them were an inch in diameter. They were of fine quality.

PARSNIPS.

Thorburn Hollow Crown.—Seeded May 24. The roots did not get very large, but were very tender and sweet.

PEAS.

First and Best, Earliest of All Alaska, and Russian Field Pea.—All came up readily, and by July 7 the varieties First and Best and Earliest of All Alaska were in bloom. The Russian Field Pea did not begin blooming until later. They grew all summer, and some of the vines were over 3 feet long, having blossoms, new pods, green peas, and ripe peas on the same vine. They were still growing when frost killed them September 21. The Russian Field peas did not mature.

RADISHES.

Early Olive Shaped, French Breakfast, Scarlet China Winter, and *Early Long Scarlet.*—All varieties produced fine, crisp roots in a few weeks. The Early Long Scarlet was the best, but frost came too soon for seed to mature.

RUTA-BAGAS.

Bangholm Yellow.—A bed 3½ feet by 8 feet was sown May 17. A mistake was made in sowing them too thickly, so many of the roots did not get above ordinary size, weighing from one-half to 1½ pounds. One plant, however, with plenty of room, grew to be a giant. This root weighed on October 1 (when it was pulled) 10 pounds.

TURNIPS.

Large White Norfolk.—In this case, as with the ruta-bagas, the seed was sown too thickly and the roots did not grow very large, but they were very sweet and tender.

SALSIFY.

Large White.—Good stand, but the roots did not get very large.

SPINACH.

Savoy-leaved and *Monstrous Virofloy.*—Both varieties came up in about 8 days' time and started to run to seed right away, setting no leaves.

POTATOES.

Early Burbank.—Planted May 18. They grew well and set fine tubers, none of which were uncommonly large, but they seemed to be fully matured October 1, when they were dug.

CLEARING LAND.

In addition to the half acre on which the above-described crops were grown Mr. Nielsen and his helper cleared 5 acres of land in the southwest corner of the reserved tract. Fig. 1, Pl. XIII, shows this corner and the nature of the land. It is high and level, with but a light growth of bushes skirting the edge of the timber which may be seen in the background. The reservation joins the village site at this point and it presents favorable conditions for culture. The soil is a sandy loam well adapted to any kind of crop. Three acres of the cleared land have been broken and are ready for spring crops.

A LOG SILO.

As a matter of experiment I also directed him to build a log silo The silo is destined to be an important adjunct to farming in the coast region of Alaska, and if log silos can be successfully used a point will be gained for the settlers, who in many places will have difficulty in procuring lumber, and where they can get it at all it will be expensive. The silo built is a small structure, 8 feet square inside, the logs dressed smooth on the inside and chinked with moss and clay. It was filled with grass in the early part of August. The success of the venture will not be known until next spring.

OTHER IMPROVEMENTS.

Mr. Nielsen also built a log barn 12 by 34 feet inside for the shelter of work oxen and implements. It will answer the purpose temporarily. This barn in the rough, before it was chinked and completed, is shown in Pl. XIV, fig. 1. Fig. 2 shows some of the immediate surroundings where we have broken ground. The structure to the left is the Russian church; in the center, the priest's house; and on the right, the Russian school, provided by the church and taught by the priest and his assistant.

Mr. Nielsen also dug a well and put in a pump. The depth of the well is 27 feet. He struck quicksand and good water at a depth of 24 feet, but succeeded in going down 3 feet farther.

He fenced all the cleared ground, and on August 27 seeded a portion of it to wheat and rye, with a view to learning if these grains will live through the winter.

THE RUSSIAN SETTLEMENT AT NINILCHIK.

On the east shore of Cook Inlet, about 30 miles south of Kenai, is an old Russian settlement known as Ninilchik, or on some maps it is called Maunona. The inhabitants are mostly creoles, descendants of the former masters of the country, but they still speak the Russian language and profess allegiance to the Russian Church. The village can be seen from passing ships to be nestled snugly in a little valley which opens out on the inlet, and the country surrounding it has the appearance of being well adapted to farming. In fact, I had been told that some

FIG. 1.—LOG BARN AT EXPERIMENT STATION, KENAI.

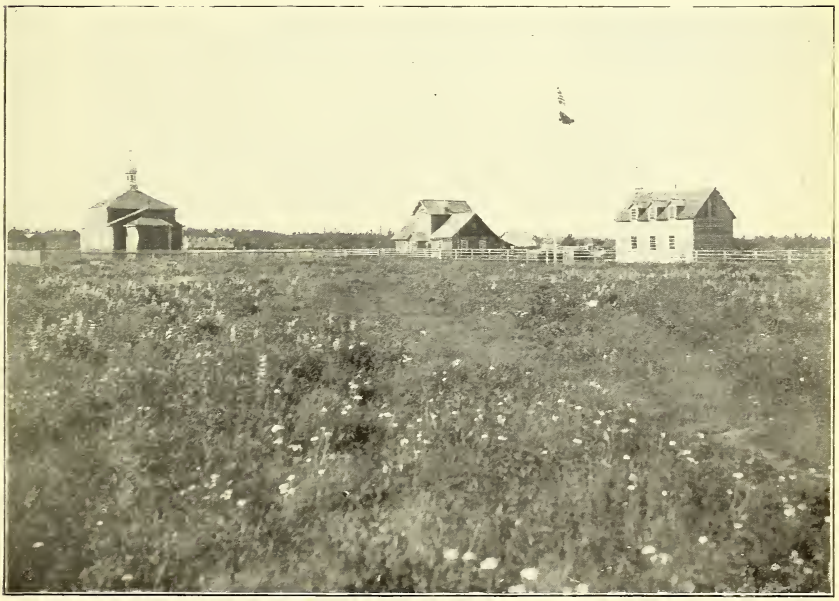


FIG. 2.—RUSSIAN CHURCH, PRIEST'S HOUSE, AND SCHOOL, KENAI.

farming was carried on successfully by these people, and as this, if it should prove to be the case, would have considerable interest in connection with our work at Kenai, I directed Mr. Nielsen to go down there and report as to what he found in the line of farming. He found that the inhabitants numbered about 60; that they kept cattle, but that fishing was their chief source of livelihood, and that their farming was limited to growing potatoes. He writes as follows on the subject:

I met the priest, who speaks a little English, and soon found that the potato fields were about 2 miles farther down the inlet, on the banks of another creek. I also learned that a man named Mike Crawford was going over to weed his potatoes that afternoon, so I concluded to go with him.

The stretch of land between the two creeks is level, and by following along the beach a person can see about three sections of land, more than three-fourths cleared, in patches ranging, I judged, from 1 to 15 or 20 acres. The soil is a black loam, and grass grows very luxuriantly everywhere. I asked my companion how far back the land was like what was in sight, but he did not know. This land seems by common consent to be left for hay.

I asked him why some of this land was not cultivated and potatoes raised nearer home. He replied that it had been tried in places, with good potatoes the first two years, but after that the potatoes were smaller until the fifth or sixth year, when they were all small. So it was abandoned.

We finally reached the potato patches. They were on a steep hillside sloping toward the south, so steep, in fact, that all the cultivated land washed down into the creek last summer, and this year they had to spade up other patches where there was grass last year, and had therefore not washed.

Their method of culture is somewhat peculiar. The ground is all spaded over in the spring; then at planting time it is hilled up in beds about 4 feet wide and running lengthwise up and down the hillside. In these beds the potatoes are planted about 8 inches apart, so that when the tops grow up they form a complete covering for the ground. The potatoes are then simply weeded, never touched with hoe or spade until digging time.

In the village the answers they gave me as to why the flat clear land near home was not used were always the same, viz, the land seemed to give out in five or six years.

No kinds of field grains are raised. The excuse the people gave for this is that no seed was procurable near there and nobody knew where to get it.

I next questioned after garden truck, for the only crops I noticed were potatoes and turnips, and in some places a few plants of kale. Their answers were varied on this subject. One man (F. Koslikoff) said it was too much trouble, others said the cattle destroyed it, and still others said they had no time, as they were away fishing all summer. The priest, a young man of twenty-four or five years, on being asked if they had school there, replied, "Yes, we have school." I asked, "American school?" "Yes." "Who teaches it," I inquired. "Me," he said. But a few questions disclosed that he knew but very little English, and that he consequently could not teach it.

Each family owns at least one cow, a few own two cows, and one man has three, but one of them was for sale, as he said it took too much hay to keep them through the winter. There are about thirty head of cattle there altogether. They are of old Russian stock and have been inbred so long and so closely that the average cow weighs less than 500 pounds. The individual cows give about 2 quarts of milk to a milking when fresh and on good grass, but this has to be divided with the calf. These people believe that the cow can not be milked without the calf. They turn the calf to the cow until she lets down the milk, then they pull the calf away and milk until they can get no more; then the calf is used as a starter again, and when the milk comes the calf is pulled off while more milk is drawn into the bucket; and this is repeated until the cow is milked clean. This practice is so general that last spring when John Matson's (a Laplander resident of Ninilchik) cow's calf died, he went over to his neighbor, who had two cows and two calves, and borrowed a calf, so he could milk his cow, promising to raise the calf for the use of it. His neighbor could use one calf for both his cows.

The whole may be summarized in saying that these people have no method in farming. There are no crops raised except as above noted. Manure lies piled up against the stables many feet deep. The men fish in summer and cut wood as it is needed in the winter. The women and children scour the woods in the summer, picking up dry branches and brush to cook by. There seems to be no desire to live better next year than this.

While these people are easy-going and unprogressive, it would seem that some encouragement in the way of the distribution of seed, grain, and, above all, a demonstration by the experiment station as to what it is possible to do there in the line of farming, would probably act as a stimulant to spur them on to better work. The region about Ninilchik offers as good opportunities for successful farming as can be found anywhere in Alaska.

WORK AT KADIAK.

Some experiments in grain-growing were undertaken at Kadiak the past season on a small scale. To this end three garden patches were rented from settlers. Only one man was hired, and he only for the growing season. The results have been disappointing, not, indeed, because of cold weather, but because the season was abnormally dry at Kadiak, and the crops were actually killed by the drought. The garden patches which were secured for the trial of these grains were located on the beach and consisted of very sandy and gravelly soil. In ordinary seasons this soil would have answered the purpose admirably, but the past year was so dry during the greater part of the summer that the crops failed to grow in this sandy soil. A few heads of barley matured, but on the whole the results were not satisfactory.

FIELD CROPS.

WHEAT.

Romanow.—Seeded May 1. It was in bloom July 23, and that which survived was ripe and gathered September 28.

OATS.

White Russian.—Seeded May 1. A good stand was secured and seed matured by September 25.

BARLEY.

Manshury.—Seeded May 1. Made a very good start, but, owing to cold weather, came along slowly. Some of it matured by September 28.

BUCKWHEAT.

Silver Hull.—Was a decided success. It grew to a height of 2 feet and matured plump seed.

FLAX.

Riga.—A bed of this was seeded, but did not grow as well as was hoped. The plants reached a height of 14 inches and were full of seed, some of which matured before frost came.

CLOVERS.

Red and Alsike.—Both made good stands, but grew very slowly. Most of it was killed out by the dry weather.

ALFALFA.

A bed was seeded which did comparatively well. The crop grew to a height of 15 inches, and was in bloom when frost came.

VEGETABLES AT KADIAK.

All the hardy vegetables have been grown at Kadiak with marked success. In normal years there are but few places where finer gardens can be found. Several residents of Kadiak are noted for their successful gardens, among whom are Mr. Frederick Sargent and Mr. Harry Cope. The Baptist Orphanage on Wood Island had an excellent garden last year. There is no question but that the climate admits of as good success with vegetables here as it does at Sitka.

BEANS.

Black Wax, Six Weeks, and Broad Windsor.—These varieties were seeded June 3. They grew fairly well. All were in bloom August 1, and all were ready for use from September 1 until frost came.

BEETS.

Eclipse, Blood Turnip, and Egyptian.—Seeds failed to germinate, probably owing to the dry season.

CABBAGE.

Express.—Seed sown in cold frame and produced fine plants, which were transplanted June 20. Small compact heads formed by September 18.

CAULIFLOWER.

Snowball and Extra Early Erfurt.—These were seeded and treated in the same manner as the cabbage. The plants produced good cauliflower of medium size by August 20.

CARROTS.

Early Scarlet Horn and Chantenay Scarlet.—These varieties were seeded, but failed to grow.

CRESS.

Pepper cress.—Produced a splendid growth and was ready for use in a short time. It was left all summer and matured seed.

KALE.

Dwarf Green.—Seed sown in cold frame. Fine plants were produced, which were transplanted June 20. They grew to be fine large plants.

KOHL-RABI.

This vegetable grew well but not very large. Bulbs were about 2½ inches in diameter.

RUTA-BAGAS.

Yellow Swede.—Only a few seeds germinated, but what grew were excellent, both as to size and quality.

SALSIFY.

Large White.—A fine stand was secured and an excellent crop. Some roots were nearly an inch in diameter.

SPINACH.

Seed was sown twice but failed to germinate.

LETTUCE.

Black Seeded Simpson, Prize Head, and Victoria.—All three varieties did well and produced fine heads.

ONIONS.

Large Globe and *Large Red Wethersfield.*—Seed failed to germinate.

PARSNIPS.

Hollow Crown.—Seeds were planted twice but failed to grow.

PEAS.

Earliest of all Alaska and *First and Best.*—Both came up well and grew to a height of 18 inches, were in bloom July 5, and ready for use August 1.

RADISHES.

Olive Shaped, Long Scarlet, French Breakfast, and Scarlet China.—All varieties produced good roots in a few weeks.

REPORT OF REV. T. SHALAMOFF.

The Russian priest at Kadiak, Rev. Tichon Shalamoff, whom I supplied with seeds, was more successful than the man who had the experiments in charge. He reports as follows:

I sowed the seed you sent me in an old garden which had heretofore been used in growing potatoes. It is black earth and I fertilized the grains with cow manure, and for the vegetables I put on some chicken dung in addition. I sowed the wheat, oats, barley, buckwheat, and peas on May 5, and on May 15 they all were up. Two months later, July 15, the barley began to head, and July 22 the wheat was heading and the buckwheat in flower. The oats did not head until August 1. On September 4, I harvested the barley; on the 10th, the oats, and on the 19th, the wheat. The oats and wheat were not quite ripe when cut, but I was obliged to harvest them because the chickens had discovered the grains in them and threatened to destroy the crop.

The vegetables also did well. Three successive crops of radishes were raised on the same ground. Turnips, carrots, and cabbages were fine. The seed of the latter was first sown in a cold frame and the plants transplanted.

I distributed the seed sent me for distribution among the natives. Those who cultivated them properly raised satisfactory crops of turnips, radishes, carrots, and lettuce. The cereals were sown only in the villages of Action and Kaguyak. The Indian Isidor Kichook, of the village of Action, raised some good barley.

In conclusion, I can not refrain from expressing the hope that the Government will teach them how to grow barley, rye, potatoes, and other food plants. In view of the fact that the fur trade has been completely ruined by the extinction of the sea otter and that even the fisheries are threatened, famine stares these people in the face.

INTRODUCING DEER AT KADIAK.

Referring to the statement of the Rev. Tichon Shalamoff, given above, that starvation is staring the natives of Kadiak Island in the face, I can not refrain from adding that the case seems to me to be a serious one. While it is undoubtedly a good plan to distribute seed among

these people of varieties which may be cultivated with comparative ease, such as buckwheat and early barley, and also of the more substantial vegetables, one can scarcely hope that they will become proficient farmers without years of experience and teaching. As a means by which the threatened famine can be averted among these people, it has been suggested that the Government take steps to introduce deer on Kadiak Island. These deer would in a short time increase sufficiently to add materially to their food resources. At present there are no deer on Kadiak Island, nor any other animals that can be hunted for their meat, except bears. All the islands in the Alexander Archipelago abound in deer. It would neither be costly nor difficult to procure, say, 150 or 200 deer for introduction on Kadiak Island. There can scarcely be a doubt as to their surviving and increasing. The climate is not materially different from the climate in southeastern Alaska. It would, of course, be necessary to issue and enforce regulations to prevent their being hunted until they are established, and thereafter regulate the hunting. If some such plan could be carried out promptly, it would materially aid in ameliorating the condition of the natives, which is becoming more and more precarious every year.

ALASKA AS A STOCK COUNTRY.

Cattle are kept at every settlement of white people in the coast region. They are in most cases kept exclusively on native forage and they are everywhere doing well. At Wrangell, Juneau, Skagway, Haines Mission, Sitka, Yakutat, Kenai, Ninilchik, Kadiak, Unga, Unalaska, and at many smaller places cattle are kept with marked success. At some of these places, chiefly Juneau, Skagway, and Sitka, dairymen regularly supply the market with milk. My report for last year contains statements on this subject from many of those men who are now keeping cattle, and their experience leads them unanimously to the conclusion that cattle can be kept successfully in the coast region.

The climate is no bar to stock raising; the amount of natural pasturage is the only limitation. In southeastern Alaska, where the forest growth is heavy and universal, the natural meadows are, for the most part, small and not numerous, and outside of these places recourse must be had to cultivated forage crops. But southeastern Alaska, by which is usually meant the Alexander Archipelago, constitutes but a small fraction of the Territory of Alaska. As we pass westward from Sitka there is a gradual increase in the amount of grazing land and a corresponding decrease not only in the forest areas but in the size of the timber. At Kadiak the forest has practically disappeared and its place taken by grass, which in places is very luxuriant. Kadiak and adjoining islands contain not less than 1,000 square miles, most of which can be utilized for pasture; for, although mountainous, the mountains are covered with grass to the snow line. In the bays, inlets, and on the islands of Prince William Sound there is likewise a large amount of pasture awaiting utilization. And westward, along the Alaska Peninsula, grass is the leading form of vegetation.

That cattle and sheep thrive well in the coast region of Alaska has been abundantly and thoroughly demonstrated. The Russians kept cattle at their various settlements, and at Kadiak may yet be seen specimens of the little Siberian breed which was introduced by them. But the best evidence as to the adaptability of the region to stock raising is furnished by the experience of the Alaska Commercial Company. The company's superintendent at Kadiak, Mr. M. L. Washburn,

has very kindly furnished me with some data on this subject which are exceedingly interesting and peculiarly valuable because his test has been made on a fairly large scale, during a period of many years and under conditions which leave no doubt as to the prospects for success by practical stock raisers.

EXPERIENCE OF THE ALASKA COMMERCIAL COMPANY.

CATTLE.

Mr. Washburn says:

We have bred stock on the islands of Kadiak, Ukamak, and Long Island. On Long Island we have about 40 head of cattle. These cattle are fed from two to six weeks each winter. The remainder of the time they have been able to get their own subsistence. During occasional winters we have carried our stock through with no feeding. We have had very good increase from them, and should say that the percentage of calves raised from the breeding cows is about 75. The cattle on this island have not been housed except during the short period when we were obliged to feed them.

On Ukamak Island we have a herd of about 20 head, which are entirely self-sustaining. We have not found it necessary either to feed or shelter these cattle during the winter season and the increase has been fully as good as that of the herd on Long Island.

On Kadiak Island we have not kept any stock cattle, but only a small herd of dairy cows and some working horses. These we have, of course, fed regularly during the winter season for about five months. We are able to cure sufficient hay on a lot we have leveled, and we have used the only mowing machine in western Alaska. We have obtained very good results from feeding the Alaska hay to both cows and horses, and find that they require no more grain when fed this hay than when we feed hay imported from California.

ANGORA GOATS.

On Ukamak Island we also have a flock of 50 Angora goats, which have increased about 60 per cent a year since they were placed there. They have given very good results in mohair, which is of good quality and fine texture.

SHEEP.

On one of the islands in Kadiak Harbor we have kept a flock of sheep for the last sixteen years, since 1883. These sheep have not been fed at any time during this period, but they have been changed to another island in the fall, so as to give them fresh grazing during the winter season and back again to the original island in the spring. We have averaged about 5 pounds of excellent wool to the head per year, and the yearly increase has been something over 60 per cent of the breeding animals.

I would say that we have made no business of raising stock, and we have had no men who are especially experienced in this line. I have little doubt but that with experienced men the business of stock raising might become a reasonably profitable industry on Kadiak and adjoining islands.

This account is so definite and the results so concrete and so affirmative of the most sanguine expectations, that they may be accepted as proof positive that this part of the coast region is a good stock country, not only for cattle but also for sheep and Angora goats. And, as already stated, the whole region west of Alexander Archipelago will admit of stock raising on a more or less extended scale. At Yakutat are thousands of acres of grass land, and at Unalaska, Coal Harbor, Unga, and other places cattle are kept successfully and feed is abundant everywhere in the Alaska peninsula.

As the population on the Yukon, at Cape Nome, and other gold camps increases, there is sure to be a good market for beef and mutton. The stock can be raised at a minimum of expense and transportation certainly ought to be much less from this region to the places named than from Puget Sound ports, from which supplies now come.

THE COOK INLET COUNTRY.

The Cook Inlet country, in which may be included the regions tributary to Knik Arm and Turn-Again Arm and the lower valley of the Sushitna River, is likewise well suited to live stock. Cattle have been kept for many years at Kenai, Ninilchik, and other places on the inlet entirely on native feed, and my own observations on that region lead me to the conclusion that as a stock country it will be found unsurpassed. There is considerable snow in winter, the average depth on the level being between 3 and 4 feet, and the feeding period would be longer than on the coast, but feed is abundant, luxuriant, and nutritious. The cattle I have seen there were in excellent condition, in that respect comparing favorably with cattle on a well-managed farm.

In this connection it is pertinent to call attention to the statements of Capt. Edwin F. Glenn, of the Twenty-fifth U. S. Infantry, who has spent two seasons in that region in command of an exploring party operating chiefly in the Sushitna River Valley and the country tributary thereto, primarily with a view to finding a practicable route to the Yukon, but also to gain information in regard to the resources and possibilities of the country. In conversation with Captain Glenn he expressed the opinion that the Sushitna Valley was well adapted not only to stock raising, but to general farming, the soil being deep and rich and the climate favorable during the growing season. I glean the following facts from his published statements (Seattle Post-Intelligencer, November 4, 1899). He navigated the Sushitna River with the stern-wheel steamer *Duchesney*, bought for the purpose, for a distance of 140 miles from its mouth. He surveyed a military reservation 1 mile square at the mouth of Indian Creek, on the Sushitna River, which he states was "well supplied with wood and water." As to the route, he says:

> There has been much said about the impracticability of making a road through that country. It is a plain geographical proposition. Here is the Matanooska River, lying in a valley 20 to 30 miles wide, and the Sushitna in a valley 30 to 50 miles wide, and no obstructions at their mouths. Either of them is feasible for a wagon road or a railroad or any other kind. The wagon road follows where the Indian trail was and the trail follows the river. * * * The same conditions exist in the Kuskokwin and the Yukon and the Copper River valleys, except that in the last named there is the difficulty of the glacier near its mouth. After getting beyond the coast range it is entirely feasible.

PLENTY OF FORAGE FOR STOCK.

On this subject he says:

> Live stock is easily supported in that part of Alaska. There is plenty of forage, red top, and bunch grass, some of which grows as high as a man's shoulder. My party to Eagle lost neither horse nor mule on their long journey. They dropped off one mule, which had become footsore and useless to the expedition, and he was found and picked up by Captain Abercrombie's party and brought back to Valdez. Stock taken by prospectors last year into the Taglina country, behind the glaciers, supported themselves on wild forage, and were found all right this year.

That it is possible for domestic animals to support themselves in that region in the open, through an Alaskan winter, is a fact worth noting.

As to the general resources of the region, Captain Glenn says:

> I want to go on record as saying that the Cook Inlet country is the garden spot of Alaska, for the reason not only of the mineral wealth to be found there, but if Alaska is ever peopled it is the one section which will certainly produce vegetables and cereals in abundance. There is plenty of coal throughout the entire length of Cook Inlet. I found it outcropping in at least half a dozen places on the Sushitna

and also on the Yetno. I used the coal, of which a large ledge outcrops at Tyonek, for steaming on the *Duchesney*, and found it about as satisfactory as any; indeed, for her grates the best. The mail steamer *Dora* is using this coal right along. There is an unlimited amount of it. It is soft but suitable for burning under boilers.

As bearing on the resources of the region, I can add that I have some personal knowledge in regard to the coal on Cook Inlet referred to by Captain Glenn. The coal deposits appear to be very extensive and of very fair steaming quality. I have been on the *Dora* when she has taken on coal there and watched the result of its use. The engineer told me that he preferred it to the coal heretofore supplied to the ship, which was shipped up from below.

It is further of interest to note, because bearing on the development of the region, that a company of capitalists has this year opened coal mines at Homer, on Kachemak Bay, Cook Inlet. A dock at which large steamers can land has been built, and a railroad 11 miles long for the conveyance of the coal is under construction.

Summing it all up, we have in the region about Cook Inlet many thousands of square miles, bordering on arms of the sea and traversed by navigable rivers, with extensive coal deposits and the surrounding mountains rich in gold and other minerals; a deep and fertile soil which supports a luxuriant vegetation; a climate which permits even abandoned stock to live through the winter; the choicest of game and fur-bearing animals on land, and the waters teeming with fish which are shipped to distant lands as luxuries. All these resources are awaiting the enterprise and skill of man to be developed and transmuted into wealth.

Where else can similar opportunities for hardy frontiersmen be found? That farming is possible there is proved by the fact that at the Kenai station, on which we began work this year, we succeeded in maturing spring wheat, barley, oats, flax, and buckwheat, although the work of clearing and breaking was not begun until the latter part of April (the men arriving there April 24), and the earliest seeding was not made until the middle of May.

REPORTS FROM SETTLERS.

Last year I submitted a number of reports received from settlers all over the Territory, which proved that efforts at gardening were being made at all points, and that even in the most adverse situations these efforts meet with some degree of success. They proved that domestic live stock, especially cattle, could be kept in all parts of Alaska, and they admitted of the inference that with a better understanding of the climatic conditions and more experience in working the soil, the results would be vastly increased.

An attempt was made the present year also in connection with a distribution of seed to obtain further data on what the settlers were doing in these lines, but only a few have so far responded to the inquiries made. Many more replies will undoubtedly come in later. I submit the replies which are on hand at this writing:

WORD FROM TYONEK.

TYONEK, ALASKA, *April 9, 1899.*

DEAR SIR: The garden seeds you directed sent to me March 5, 1898, were duly received. The season was unusually wet and cloudy. Potatoes, ruta-bagas, turnips, radishes, and lettuce did well. The seasons are extremely local and vary greatly. The best garden that has been grown here was grown by me in 1891. We had one hundred and eighty-seven days growing weather that year. I planted potatoes April 9 that year. The shortest season in nine years (the length of my residence

here) was one hundred and twenty days. The present season bids fair to be a good one. We planted potatoes on the south slope of a steep hill on April 4. I regret very much my absence from this place last fall, otherwise I should have informed you of the results of last season, and obtained a greater variety of seeds. I will send you a report this coming fall.

Very respectfully, yours,

THOS. W. HANMORE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GOOD SUCCESS AT HOPE CITY.

HOPE CITY, TURN-AGAIN ARM, COOK INLET, ALASKA,
July 22, 1899.

DEAR SIR: We received and distributed the vegetable and flower seeds you sent us this spring. Some of them we retained for our own use.

In 1898 we grew the following crops:

Potatoes.—Planted from May 26 to June 1. Harvested from September 25 to October 4. On 600 square yards we harvested 2,326 lbs. (This is at the rate of 340 bushels to the acre). They are not first quality, however, being a little too watery.

Cabbage.—Early York, transplanted May 25; good for table August 23. The average weight of heads was about 3 pounds.

Ruta-bagas.—Sown May 26. They grew as well as they will anywhere. Pulled October 2. Best weighed 5½ pounds.

Turnips.—Purple Top; sown broadcast May 26. Ready for table July 27. Best weight October 2, 6½ pounds.

Beets.—Early Blood Turnip; sown May 26. Average weight October 2, from ½ to 1 pound.

Carrots.—Danvers Orange Half Long; sown May 26. Ready for table August 20. They were small, only 1½ inch in diameter. The same applies to parsnips.

Radishes.—Can be sown from May 10 to August 10, and may always be depended on to yield a large crop. We began to pull ours last year, June 15.

Onions were with us a total failure last year.

Yours, truly,

ROLL BROS.
Per G. ROLL.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[The vegetables shown in Pl. VII, fig. 1, were grown by the writer of the above letter the present season, and shipped to friends in Sitka where the photograph was taken. I have no report from him on the subject.—C. C. G.]

GARDENS INCREASED ONE HUNDRED PER CENT.

COOK INLET, ALASKA,
PEARL ISLAND, FOX RANCH, SELDOVIA,
August 27, 1899.

SIR: The vegetable seed sent this spring arrived in good time for use, and was distributed among the families of Alexandrofsky settlement by the chief of the village.

The flower seed arrived rather late for use, but was given to Seldovia settlement and we expect to see that village decorated with flowers next season.

This year has so far been unusually dry in the inlet, but all the vegetables are thriving well. The area in gardens has increased more than 100 per cent over last year which is undoubtedly due to the receipt of seed from the Department. The fox business claiming all attention, we have not been able to do any gardening worth speaking of this year.

In regard to the vegetables raised by the natives, as mentioned above, we can truthfully say that the crop is satisfactory all around, and a surprise to anybody who knows the natives' careless ways in handling things generally.

It is getting late in the season to travel around, and much as we would like to select a crate of vegetables for your inspection, we will have to postpone it to another year.

Respectfully,

ANDERSON BROS.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

WEATHER FINE AT COAL HARBOR.

COAL HARBOR, UNGA ISLAND, ALASKA,
July 12, 1899.

SIR: The seeds I received from the Department on June 3 were planted the next day, June 4, and on the 14th all were above ground. On July 9 had radishes 6 inches long on the table. Potatoes, which were planted the same time as the seeds, have been hilled up for the second time. All the grains are looking fine, and the buckwheat is at the present time 5 inches high. The wild berries are almost ripe. The grasses and oats are also doing well, and are from 2 to 3 feet high. So far this summer the weather has been extremely fine, and everything is in a forward state. An apple tree has grown from a seed planted two years ago. It has been outside, with but little protection, and is looking fine and healthy. Rhubarb and horse-radish the same, though never protected from frost. All the brooks are dry for lack of rain, and a well in the place 40 feet deep is in the same condition.

Yours, truly,

A. S. TIBBEY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

STOCK FEED ABUNDANT AT UNGA.

UNGA, ALASKA, *July 20, 1899.*

SIR: I have forwarded to your Department by this mail sample of grass grown in the numerous valleys of western Alaska. These valleys are of great size and produce luxurious grass, which should attract the attention of stock growers and those interested in raising hay. The sample sent was cut by me on July 2 of this year, and is not by any means especially selected for this purpose. I have traveled through valleys containing many hundred acres of such grass, and some much taller than the sample sent. Grasses in many of the valleys, where they are protected from the spring winds, are very early. I have seen grass on April 25 which was 6 inches high.

In my opinion many varieties of vegetables can be grown successfully if proper care is observed in planting, etc. I have a small garden of a great variety. To prove my assertion I planted May 3, and on June 20 took from the garden as fine a lot of radishes, lettuce, and onions of large size as can be grown in the States in the same time. Potatoes planted at that date are looking fine, with large, healthy stalks, and in full bloom. They are a late variety, the Burbank, as I was unable to procure an early variety.

I believe, with many others, that a thorough test by the Government on this island would result in much good, especially to the native population as well as to the whites who live on them. The most difficult matter here is to get seeds, as the stores do not carry them.

Very respectfully,

LEWIS L. BOWERS,
Deputy U. S. Marshal.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

INTEREST GROWING AT UNALASKA.

UNALASKA, *October 6, 1899.*

SIR: The seeds were received in the early spring and planted as soon as the weather permitted. The results have been very satisfactory, so much so that we expect to enlarge the garden next year. The kale, lettuce, carrots, and radishes did very well. The onions came up well, but were mistaken for weeds by a native boy and pulled up. The turnips excelled all the rest, both in quality and quantity.

Very little has been done here in the line of gardening during the past years. By degrees the people are tilling the soil and thus supplying their homes with food. A new silo is in operation this season, and we expect the result will have an influence on the stock industry of the place.

Thanking you for the favor in sending seeds, we remain,

Yours, respectfully,

A. W. NEWHALL,
Jesse Lee Home.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GARDENING ON THE KUSKOKWIM.

BETHEL, KUSKOKWIM RIVER, AKASKA, *August 22, 1899.*

SIR: Your favor of July 2, 1898, came to hand July 27, 1899, and under the above date I proceed to answer your queries to the best of my ability.

Gardening for small table truck, such as lettuce, radishes, and turnips, has been about the limit of our agricultural efforts. Potatoes the size of goose eggs have been raised, but the season is never long enough for this vegetable. Cabbage does real well, heading to a fair size. Peas do well, the vines producing two and sometimes three messes of peas. Beets grow to the size of breakfast radishes and then run to seed. Onions from sets and from seed have been tried, but no success has been attained.

Our garden is the result of years of work of scraping soil from around buildings and paths. The natural soil of our garden is pure sand, but by the process of gathering soil, we have improved it somewhat.

The last week in May, when the season is forward, the garden is spaded and a few seeds put in—all that frost will not hurt. The first week in June, however, is our gardening week. Cabbage plants are set out about eight or ten days after the garden is spaded, and potatoes are planted at about the same time. During the month of June the garden has to be watered by hand, as there is very little rainfall in this month. Much of the success of the garden depends upon this watering. If well done, the garden flourishes; otherwise, everything gets a poor start. The last of the garden stuff is harvested from the next to the last week in September to the last week. We have no experience in stock feeding or in farming. The only reason that farming and gardening would not succeed in this country is on account of the short season. This, of course, is the private opinion of one who knows nothing about farming.

Our missionaries at Carmel do a great deal of gardening. The late Mr. Clark, of Nushagak, used to keep quite a number of cattle, and probably you could get some information about stock feeding from Nushagak or Carmel.

Yours, very respectfully,

J. H. KILBUCK.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

MORAVIAN MISSION, CARMEL, KUSKOKWIM RIVER, ALASKA,
August 18, 1899.

SIR: Many kinds of seeds sent by you were received at this mission during the summer and are greatly appreciated. As the mission has for a number of years past made it a point to encourage gardening and has freely distributed seeds to the white settlers, as well as to all natives desiring them, your seeds come very handy, although they were too late for use this summer.

Some of our seeds sown this year were Government seeds from last year, wherefore we are pleased to report the good results.

Our ground is old soil and has generally been thrown up in beds, as you prescribe, the object being to get more heat into the ground. Then we always put in all the fertilizers we can secure. All of our wood ashes, manure of chickens, pigs, and at times of cows, and especially closets, was put in the ground, so we have good, rich soil, and a splendid crop this year. Owing to the warm, dry summer, it is better than ever before.

Potatoes raised from seed grown in the country always seem to do best here. Our crop last year was 45 bushels of potatoes, and from all appearances this year will be increased 100 per cent. Cabbage, peas, carrots, lettuce, and radishes are doing well, but turnips are being destroyed by small white maggots, which go right into the turnips and eat off all small roots. Cabbage and radishes are also molested. I, with others, claim that they are the maggots found on the fish when hung up to dry, put there by flies. Some say they are not. Next year we shall try if lime will prevent this evil.

Thanking you for remembering us with seed, and hoping to receive some more next year, we are,

Yours, truly,

J. H. SCHOECHERT,
Missionary.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EFFORTS ON KOTZEBUE SOUND.

FRIENDS MISSION, KOTZEBUE SOUND, ALASKA,
April 6, 1899.

SIR: In reply to your inquiries of July 2, 1898, we have spent only one summer in this region; have raised lettuce, radishes, and turnips with good success. We expect to plant a larger variety of seeds this season, and will inform you of results. I think hay could be made from native grass in a limited quantity. Deer moss is abundant. Berries grow wild in abundance—such as salmon, blue, crow, and cranberries. We are located on the coast 12 miles to the northward from Cape Blossom.

Respectfully,

ROBERT SAMMS, *Missionary.*

Prof. C. C. GEORGESON, *Sitka, Alaska.*

THOMAS BAKER'S FARM, NEAR KILLISNOO.

In Hootz Bay, on Admiralty Island, some 6 or 7 miles from Killisnoo, is a farm of some local renown, usually known as Baker's farm. The owner, Mr. Thomas Baker, came to Alaska some five or six years ago from the State of Washington. He was favorably impressed with the climate and the vigor of the vegetation and determined to try farming in Alaska. After some investigation as to sites, he located in a sheltered cove in the above-named bay. He found here a tract of land so situated that it was sheltered on the north by mountains and protected from the raw winds from the sea by a belt of timber, and at the same time had an exposure which admitted the sun.

The writer was enabled to visit this farm in September last through the courtesy of Captain Kilgore, of the revenue cutter *Perry*, who kindly consented to run in there on one of his cruises. The farm would be a credit to almost any State in the Union. With the aid of a yoke of oxen and the necessary implements, Mr. Baker has converted a gravelly and sandy flat into a truck farm. When he located there he found a portion of the tract flooded at high tides, at which time it was a favorite resort for ducks and geese. He reclaimed this tide land by building a dike across a narrow neck through which the water entered. (See Pl. XV, fig. 1.) Only about 30 acres are in actual cultivation. The rest, containing about 30 acres more, is devoted to pasture. He grows only such things as he can find a ready market for in the immediate neighborhood. He has attempted to sell produce in Juneau, some 75 miles distant, but the steamship companies charged him as much freight per ton for this short haul as they do from Seattle to Juneau. For this reason he is obliged to confine himself to the markets at his door. His chief market is at Killisnoo, where Mr. Karl Spuhn owns and operates an oil and guano factory and employs 150 to 200 men. Mr. Baker also disposes of considerable produce to ships which lay to at Killisnoo and to prospectors and local mining people.

Potatoes are his chief crop. The writer saw some of these dug and can testify to the fact that they compare favorably, both in size and quality, as also in yield, with potatoes grown in the best agricultural regions of the United States. (See Pl. XVI, fig. 2.) He has also several acres each in beets, carrots, onions, and cabbage, all of which were remarkably fine. Smaller areas are devoted to parsnips, turnips, rutabagas, cauliflower, kale, and other greens. He had a patch of winter rye the past season which was ripe before the end of August. He also had several acres in wheat which, however, had been seeded late for feed and was not expected to ripen. Part of his pasture has been seeded to clover, which has stood the winters well. The white clover was especially thick.

In the line of live stock, Mr. Baker keeps, besides his work oxen, a few cows, some hogs, and a large number of chickens. He has found

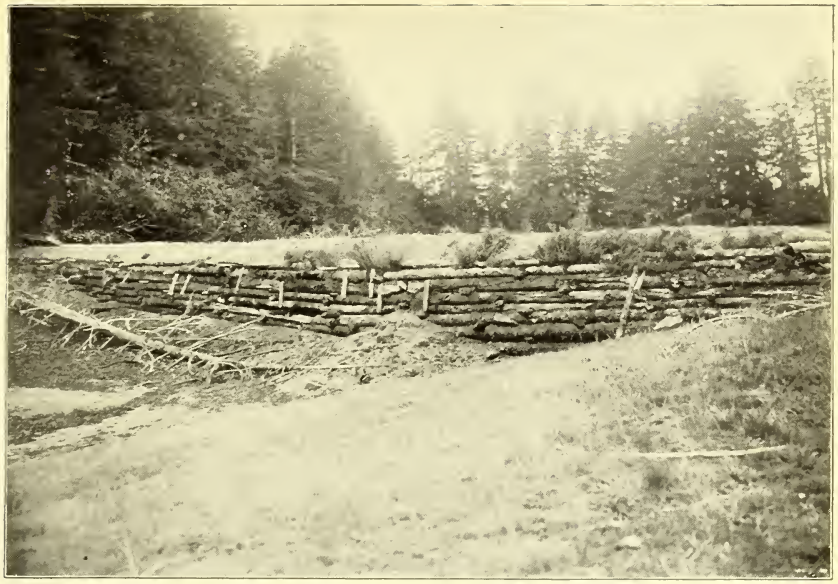


FIG. 1.—DIKE BY WHICH A PORTION OF THE BAKER FARM WAS RECLAIMED.

FIG. 2.—RECLAIMED LAND, BAKER'S FARM.

FIG. 1.—RECLAIMED LAND, BAKER'S FARM.

FIG. 2.—DIGGING POTATOES ON BAKER'S FARM.

a ready sale for the beef that he has raised and also for his pork and chickens. He has a good barn for his stock and a silo in which he preserves feed for the winter if it happens that he is short of hay.

He has as yet raised but little grain; not because it can not be grown, but because he finds it more profitable to devote his farm to trucking. Altogether Mr. Baker's farm is an instructive object lesson in regard to what it is possible to do in the line of farming in Alaska.

PLANS FOR NEXT YEAR.

The plans for next year include the location of a station in the interior, the completion of the station building at Sitka, and the erection of a barn and cottages at that station, and also the erection of a cottage at Kenai. We shall further inaugurate experiments in the selection and breeding of seed grain, and will continue the clearing and improving of land at all the stations.

THE INTERIOR.

Now that the stations on the coast have been established and enough work done there to prove that the region has possibilities which are susceptible of development, the next most important step is to ascertain what the possibilities are in the interior. To this end the writer plans to go inside as soon as navigation on the Yukon opens, with a view to examining as much of that region as it is possible to get over, but more especially the Yukon Valley. He also expects to make surveys at two or three places where the conditions appear favorable, with a view to having ample ground reserved for future experiments, and finally to begin work on one of the places thus selected.

An effort will also be made to interest settlers in the various villages on the river in our work, and, if possible, to start some experiments in growing vegetables and cereals in private gardens, somewhat after the plan followed at Sitka. It is hoped that by these means we shall be able to inaugurate tests which will demonstrate to what extent farming can be made a success in that region. The writer has attempted on several occasions to send seed, and particularly cereals, in small quantities to persons in the interior who had promised to grow them the past season, and in that way get a clew to what might be expected; but all efforts have so far failed. Packages sent through the mails have failed to reach the persons for whom they were intended, and travelers, although interested in the object sought, could not burden themselves with extra weight.

There is reason to believe that it is possible to mature the spring grains in the interior. The relatively high summer temperature and almost continual daylight during the growing season are in favor of this presumption. Moreover, prospectors are authority for statements to the effect that volunteer grains scattered in the feeding of animals spring up and mature seed, and last year the writer received a ripe head of wheat said to have been one of a bunch of that character grown on the Upper Yukon.

IMPORTANT RESULTS POSSIBLE.

Should it prove to be the case that our common spring grains can be grown in the interior, the fact will be of untold value. It will give rise to varieties which are earlier than any we know of, and it will thus open a source from which early ripening seed can be supplied for the

use of our northern States where unusually early frosts not infrequently destroy the crops before they are ripe. This object would seem to be sufficient excuse for a determined effort to test the possibilities of the interior thoroughly.

CONTEMPLATED WORK AT SITKA.

The work which is contemplated to be undertaken at Sitka during the coming season is chiefly a continuation of that already under way. The headquarters building should be completed, a barn and at least two cottages should be built on the farm, and the clearing and preparation of new ground should be continued. The improvement of the land will require the application of a large amount of quicklime to hasten the decay of the vegetable matter and also to correct the acidity of the soil. This lime should if possible be burned in an Alaska limekiln. Quicklime ordered from Puget Sound costs about $4.50 per barrel, due chiefly to the heavy freight charges. At this price it would, of course, be impracticable to use any considerable quantity on the land. The estimated requirements are about 2 tons to the acre. Limestone and marble deposits have been found in various portions of the coast region, and an effort will be made to secure this lime from the nearest available deposit. This will, of course, necessitate the construction of a limekiln, which, however, will not be a serious task.

A STEAM LAUNCH NEEDED.

This leads the writer to mention the fact that an old steam launch has recently been transferred from the Navy Department to the Department of Agriculture for use at the Sitka station. While the launch has seen service in the Navy for many years and has been superseded by a better one for the use of the marines stationed at Sitka, it is hoped that it will answer the needs of the Department of Agriculture for some time to come. In a country where the highways are all waterways it is evident that means of transportation are necessary. The mail steamers touch only at certain ports. The work of the station will cause an increasing demand for means of reaching settlements and places along the coast where no boat touches. It will not do to depend for such transportation on Indian canoes or an occasional small sailing craft. The work makes necessary an independent means of transportation. Such a launch is indispensable in conveying grass from the small natural meadows already referred to, and will be useful in hauling the limestone mentioned above. Work of this nature constantly presents itself.

THE HEADQUARTERS BUILDING.

As has been stated, the headquarters building was not completed for want of funds. The foundation should be completed as contemplated by the plans. The high winds are liable to damage it if left in the present condition. The stairway should be put in and the second story finished, means provided for heating, porch built, and the other incompleted portions finished. The bid for this unfinished work by the contractor, whose bid was accepted for the portion which has been done, was a little over $3,000.

FIG. 1.—SITKA HARBOR FROM CASTLE HILL.

FIG. 2.—GOVERNMENT WHARF AND WAREHOUSE AT SITKA.

FARM BUILDINGS.

Logs for a barn 20 by 40 feet will be cut and hauled over the snow this winter. Assistant C. H. Robison, now at Sitka, has received instructions to this effect, and the barn should be built as soon as spring opens. In addition to this, two cottages of four or five rooms each should be built—one for the use of an assistant at the station, and the other for the use of a foreman or other laborer who is employed by the year. These cottages can be most cheaply and conveniently built of native lumber, which can be obtained from local sawmills. These houses will probably cost $1,500 each. In addition to the barn, which is intended chiefly for the shelter of live stock and feed, a tool house and implement shed is needed, as is also a rough shed, or drying house, in which to shelter grain from storms during harvest. It is believed that those buildings can be put up most economically by men in the employ of the station.

COTTAGE NEEDED AT KENAI.

At the Kenai station a cottage should be built this coming year for the accommodation of the men. There is nothing now but the barn and silo already referred to. During the past year we have been paying rent for a room occupied by Assistant Nielsen and his helper. As there are scarcely houses enough to shelter the population of the village, it is not safe to count on being able to rent quarters, and with the development of the work a house is indispensable.

LINES OF EXPERIMENTATION.

The lines of research which will receive attention may be conveniently grouped under the following headings: (1) Those which relate to the soil and its improvement; (2) experiments in the selection and improvement of small grains; (3) cultural experiments with vegetables; (4) the introduction of and experiments with fruits, and (5) experiments relating to animal production.

It will not be possible to take all these up at once. To what extent they can be undertaken must of course be governed by the available funds for their prosecution. There is certain work, however, that must be inaugurated without delay. This is, first, the putting into condition of new land to fit it for the growth of cultivated crops. While this is the first essential step in the development of every farm in Alaska, it is as yet mainly an experiment. The conditions are new and the soil is of a nature not met with elsewhere in the United States. It is waterlogged and must be thoroughly drained. The surface consists largely of decayed mosses and is probably deficient in mineral elements, at least in the quantities required for farm crops. Its acidity must be corrected, and the method of handling it, to accomplish the best results, has yet to be discovered. All these things, while fundamental to the development of a farm, yet partake of the nature of experiments. The problem of drains alone is an important one. While thorough underdraining is essential, it is equally essential that this should be done in an economic manner with the means at hand, without incurring much expense in the purchase and transportation of tiles. To this end some brush drains, as heretofore noted, have already been constructed. Where stones are available these may be used to advantage.

It is quite apparent that the application of lime will be a necessary step in the improvement of the soil, but how best to procure and prepare this lime, and likewise the quantity required, are as yet unsolved problems.

In like manner seaweed appears to be a promising fertilizer. This material is washed up on the beach in great quantity in the fall, and those who live near the coast can thus obtain it for the gathering; but in what quantity it is best to apply it, or what crops will be most benefited by it, can, of course, be learned only by experiment.

The laboratory work in connection with the improvement of soils, their analyses, and the investigation of their physical characters by scientific methods, although highly essential, can not be taken up until the station is equipped with a laboratory fitted up with the necessary instruments and utensils.

In the foregoing it has been intimated that varieties of seed grain are needed which not only are early but which will also have a short, stiff stalk calculated to withstand the storms to which the coast is subject. It is possible that existing varieties can be adapted to these conditions. If no such varieties exist, they can be developed by selection and cross fertilization, all of which must of necessity involve considerable time and much careful work. The means by which this can be accomplished are in a general way: (1) The choice of varieties which now possess the desired qualities in the highest degree; (2) the selection of individual plants from among these varieties which come nearest the desired type; (3) the continual selection and cultivation of plants as individuals from seed thus selected until the type sought for is found, and finally its establishment and propagation by culture. Cross fertilization of suitable varieties is likely to facilitate this work by inducing variation, and thus increasing the chances of finding plants which possess the characters sought. Careful work along these lines continued through a series of years can not fail to bring valuable results.

It is not merely a question of developing varieties adapted to Alaska. The greatest value which would result from their development would probably be found to be in their use in more southerly latitudes. Canada and the northern tier of States would be benefited as much by the development of varieties which will withstand the Alaska climate as would Alaska itself.

Although it has been proved beyond question that the hardier vegetables can be grown in Alaska with marked success by the means and methods which have so far been followed, we have no evidence that these methods are the best which can be adopted. Experiments in cultural lines with the various classes of garden vegetables it is to be expected would reveal methods which are improvements on those now followed. The old Russian system of culture, for instance, prescribes that the soil must be heaped into beds about 3 feet wide and 1½ or 2 feet high, on which the seeding or planting is made. Potatoes are usually planted by them on such beds 8 inches apart each way and left entirely untouched until harvest, except for the pulling of the largest weeds. This method affords drainage and gives perhaps a larger exposure to sun than would be afforded beds not raised in that manner. Careful tests of such methods of culture will doubtless reveal the treatment best adapted to certain soils and to particular classes of vegetables. Experiments of this nature will be of importance in view of the fact that farming in Alaska, at least in the coast region, will always be on a comparatively small scale, in which horticulture will play an important part.

Fruit culture in Alaska is an untried field of experiment. While it has been proved that strawberries, raspberries, and currants can be grown there successfully—indeed, all three grow wild there in certain localities—the writer has learned of but one fruit tree which has advanced far enough to bear. At Wrangel, Mr. McKinnon, a local merchant, has a single apple tree which has borne a little fruit the past two seasons. Some desultory efforts in fruit-tree planting have been made elsewhere, but without success. Cherries, plums, apples, and even pears are successfully grown in northern Europe in corresponding latitudes. To what extent these fruits can be grown in Alaska is the problem which is to be solved. A crab apple is indigenous to a large section of the coast region. It is scarcely more than a bush and the apples are no larger than sour cherries, but it is possible that this species may have some value as a stock on which to root graft some of our hardy varieties of the apple. With this end in view some young trees were dug up last fall and will be planted in nursery rows the coming spring. Some seed of this wild crab apple has also been collected for the same purpose. At least two species of cranberries are natives of Alaska. They are found in great abundance on the low ground everywhere in the coast region. They are but small as to both plant and berry, but the quality of the latter is superior to that of our cultivated varieties. Merchants at Sitka buy them from the natives and ship them south, where they find a ready market. They can be kept fresh all winter by merely keeping them in water. A line of experimentation is planned in the cultivation of these berries which will aim at the enlargement of the fruit.

It is probable that valuable results may also be derived from similar experiments with the native red currant, the native red raspberry, and the huckleberries which grow in profusion everywhere. The importation of hardy cherries and plums will also be undertaken.

That cattle thrive in the coast region has already been proven, but we know nothing concerning the adaptation of the great interior to cattle beyond the fact that grass is plentiful. Whether our domestic cattle can endure the mosquitoes in summer and the cold in winter and still remain useful is a question to be solved.

Butter and cheese making are untried industries in Alaska, and as soon as the stations are developed to a point where it becomes practicable to take them up, they should receive a prominent share of attention.

In connection with the stock industry, the cultivation of forage plants, both such as are native to the region and the hardier kinds in common cultivation in the States, should be tried. Further experiments with the silo, especially in connection with the preservation of native grasses, are needed and will be taken up.

As many of these experiments will be undertaken the coming year as circumstances and funds will permit. The improvement of the soil and the adaptation of varieties of small grains to the conditions there presented will receive immediate attention.

OBSTRUCTIONS TO SETTLEMENT.

The intending settler in Alaska meets with discouragement and obstruction at the very outset. When he begins to look into the conditions on which he may acquire a home there under the homestead law he finds that they are all but prohibitory. He is confronted not only with the discouragement incident to pioneer life in a rigorous climate, where he is far from kindred, without facilities for communication with

the outside world, and without ready markets for the produce he may raise, but he is, in addition, required by the law to incur outlays of cash which no poor man can meet. He is required to bear the expenses of entry at the land office, which amount to considerable, and he must pay the cost of the survey. Before he can acquire any title, or be at all assured of the fruits of his labor, he must deposit with the surveyor-general a sum which will cover the costs of survey and entry. United States deputy surveyors charge not less than $15, and generally $20, a day for their services, in addition to traveling expenses. But few men who would seek a home on an Alaska farm can bear these expenses. Without considering the extraordinary cost of transportation for himself, his family, his work animals, and implements to an Alaskan port, and without considering the difficulties and expenses incident to the clearing and breaking of land and the construction of a home, the settler must meet expenses quadruple those which he would have to meet by settling on Government land in the States. Those who can comply with these conditions will reason that it is cheaper and easier to buy land where no such hardships confront them. It matters not, therefore, what the possibilities in agriculture may be in Alaska, the Territory can not be settled with a farming population as long as these conditions prevail.

WEATHER SERVICE.

The writer has also had charge of the weather service in the coast region of Alaska since the withdrawal from Sitka of the regular weather observer in May last. The service is made up entirely of voluntary observers, who are each supplied with a set of thermometers and a rain gauge, and who take daily observations of the maximum and minimum temperatures, precipitation, prevailing winds, cloudiness, etc. The writer's duties consist in keeping them supplied with blanks and with instruments when accidents happen to those furnished them; to receive their monthly reports and transmit them to the Chief of the Weather Bureau in Washington, a duplicate copy being retained at the headquarters at Sitka; to open up new stations where practicable, and to appoint new observers when necessary. While the work has entailed considerable correspondence, it is, on the other hand, regarded as an indispensable branch of work in connection with our agricultural investigations and deserves and receives careful attention. The following is a list of the stations from which reports have been received and forwarded to the Weather Bureau: Kotzebue Sound, Holy Cross Mission, Koserefski, Coal Harbor, Kadiak, Tyonek, Kenai, Orca, Skagway, Juneau, Killisnoo, and Sitka. The station at Orca was established late in the season, and therefore has but a short record. There have been but two changes in the observers. At Kadiak the very efficient observer, Mr. William J. Fisher, resigned and Rev. Curtis P. Coe was appointed in his place, and at Skagway Mr. George Sexton resigned and Mr. J. T. Hayne, editor of the Skagway News, was appointed in his place.

The Weather Bureau has established a station in charge of a regular observer at Eagle, in the interior of Alaska, and voluntary observers will be appointed in that region wherever practicable. The cooperation of the Weather Bureau in thus collecting meteorological data is much appreciated. They will undoubtedly be of much service to our agricultural investigations.

WEATHER CONDITIONS.

The following condensed monthly data are given from the reports rendered. They indicate the highest and lowest temperature, the mean daily temperature, total precipitation in inches, and the condition of the weather as to cloudiness:

SITKA. C. H. Robison, Observer.

1899.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Max.	Min.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	° *F.*	° *F.*	° *F.*	*Inches.*				
May	61	29	43.	4.01	3	7	21	17
June	62	33	48.3	4.99	0	9	21	16
July	87	42	56.5	2.27	6	10	15	8
August	67	40	54.5	8.35	4	7	20	14
September	68	40	51.1	8.52	4	3	23	19
October	62	30	46.3	7.90	3	5	22	17
November	57	29	43.5	7.02	2	3	25	14

KILLISNOO. Jos. Zuboff, Observer.

January	40	11	29.4	6.41	6	3	22	20
February	42	3	26.5	4.80	3	0	25	20
March	44	8	28.6	2	12	6	13	7
April	47	27	38.6	1.60	5	3	22	8
May	54	26	40.6	1.40	8	3	20	6
June	65	37	48.7	3.20	1	9	20	10
July	71	44	56.5	.90	10	11	10	4
August	68	40	53.9	1.95	4	5	21	13
September	59	35	46.8	7.40	4	4	22	19

JUNEAU. John McLaughlin, Observer.

January	44	4	27.4	4.22	11	15	5	17
February	42	4	26	3.81	15	13	.....	13
March	44	10	29.2	1.58	9	9	13	10
April	52	30	40	4.28	6	3	21	19
May	69	29	45	4.68	4	23	4	15
June	68	40	52	5.63	4	8	18	20
July	86	48	62	1.06	18	8	5	7
August	71	42	56	4.88	6	11	14	16

SKAGWAY. Geo. Sexton, Observer.

January	40	—2	22.2	0.94	18	4	9	8
February	44	—9	19.2	.88	17	3	8	3
March	47	1	23.4	.13	22	3	6	2
April	61	16	41.4	.66	11	18	1	8
May	77.5	25	47.1	1.07	14	11	6	7
June	80	34	54	1.29	10	11	9	11
July	92	41	61.4	59	19	7	5	3
September	76	30	50	4.68	5	9	16	17
October	53	16	35.7	3.05	10	15	6	10

ORCA. Capt. O. J. Humphrey, Observer.

June	77	35	51.1	.....	19	1	10	9
July	86	46	61	.....	15	2	14	14
August	78	41	57.1	.....	11	11	7	9
September	74	31	49.2	13.9	.....	.....	.....	.....
October	59	26	38.8	17.87	12	1	18	14
November	48	28	34.4	13.02	4	5	21	16

KENAI. H. P. Nielsen, Observer.

1899.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Max.	Min.	Daily mean.		Clear.	Partly cloudy.	Cloudy	Rain or snow.
	° F.	° F.	° F.	*Inches.*				
May	60	22	41	8.2	8	10	13	9
June	68	31	47.9	6.8	13	8	8	7
July	82	31	54.1	1.36	12	8	10	9
August	66	28	51.9	2.34	10	12	9	15
September	73	17	46.3	4.15	7	9	14	13

TYONEK. Thos. W. Hanmore, Observer.

January	34	— 8	5.41	1	19	7	5	6
February	38	—12	15.3	.85	17	.....	11	5
March	48	— 4	23.6	.65	22	.....	9	2
April	52	22	37.7	1.43	19	5	6	3
May	60	30	43.1	1.05	13	10	8	5
June	68	34	53.1	1.20	24	1	5	4
July	82	45	58.7	.....	18	3	10	9
August	71	38	56.4	2.72	10	8	13	17
September	70	29	49	5.51	9	11	10	14

KADIAK. William J. Fisher, Observer.

January	51	—1	25.3	4.72	10	2	9	16
February	52	5	33.5	4.44	7	3	18	14
March	64	11	36	4.17	18	4	9	11
April	61	23	35.9	3.02	15	2	13	14
May	62	24	44.5	4.97	15	5	11	14
June	76	34	54	2.11	20	2	8	9
July	82	41	59.4	.82	19	3	9	7
August	75	41	58.2	2.37	20	3	8	10

COAL HARBOR, UNGA ISLAND. H. S. Tibbey, Observer.

January	45	— 6	26.3	3.30	10	6	15	13
February	45	0	31.9	3.77	8	3	17	14
March	48	5	34.6	4.04	10	14	7	12
April	50	25	35.8	1.82	5	3	22	14
May	54	20	39.5	3.72	5	4	22	14
June	65	15	40	.39	18	1	11	4
July	79	40	54.9	6.21	12	5	14	12
August	69	42	54	4.87	5	4	22	10
September	66	32	48.7	4.99	5	3	22	11
October	58	31	43.6	5.04	7	2	22	18

KOTZEBUE SOUND. Anna H. Foster, Observer.

1898.								
June	72	27	48	(a)	20	(a)	10	(a)
July	81	32	55	(a)	14	(a)	17	(a)
August	64	38	50	(a)	8	(a)	23	(a)
September	50	25	39.4	(a)	12	(a)	18	(a)
October	43	— 5	24.3	(a)	18	(a)	13	(a)
November	19	—23	0	(a)	17	(a)	13	(a)
December	27	—39	7.2	(a)	13	(a)	18	(a)
1899.								
January	17	—31	—10	(a)	17	(a)	14	(a)
February	23	—38	— 9	(a)	20	(a)	8	(a)
March	32	—36	1	(a)	15	(a)	16	(a)
April	40	—24	12	(a)	16	(a)	14	(a)
May	59	— 4	29.3	(a)	13	(a)	17	(a)
June	53	27	37.4	(a)	14	(a)	16	(a)
July	67	34	49.4	(a)	13	(a)	18	(a)

a Not reported.

HOLY CROSS MISSION, KOSERETSKI, YUKON RIVER. Rev. R. J. Crimont, Observer.

	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Max.	Min.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1898.	° F.	° F.	° F.	*Inches.*				
November	32	—23	1.9	2.48	9	10	11	13
December	30	—37	— 3.4	.....	9	15	7	5
1899.								
January	35	—40	— 3.2	5.10	15	6	10	3
February	39	—37	— 3.1	1.46	18	5	5	0
March	45	—16	15.6	1.49	14	9	8	6
April	46	0	27.3	1.42	13	9	8	9
May	57	13	39.4	.30	18	12	11	8

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